

S.N. 89/759781

LANGEL 09/759781 3/2/04

Page 1

=> file hcaplus

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FILE COVERS 1907 - 3 Mar 2004 VOL 140 ISS 10
FILE LAST UPDATED: 2 Mar 2004 (20040302/ED)

This file contains CAS Registry Numbers for easy and accurate substance identification.

=> d que 135

L1 (19) SEA FILE=REGISTRY ABB=ON (107-35-7/B1 OR 124-38-9/B1 OR 127-17-3/B1 OR 14265-44-2/B1 OR 22537-22-0/B1 OR 471-34-1/B1 OR 50-99-7/B1 OR 546-93-0/B1 OR 556-50-3/B1 OR 56-40-6/B1 OR 56-86-0/B1 OR 59-23-4/B1 OR 60-00-4/B1 OR 64-19-7/B1 OR 74-79-3/B1 OR 77-92-9/B1 OR 9005-79-2/B1 OR 9007-28-7/B1 OR 97-67-6/B1)
L2 (1) SEA FILE=REGISTRY ABB=ON L1 AND CARBON DIOXIDE
L3 (18) SEA FILE=REGISTRY ABB=ON L1 NOT L2
L4 (65226) SEA FILE=HCAPLUS ABB=ON WASTE(4A) GAS?
L5 (443361) SEA FILE=HCAPLUS ABB=ON L2 OR CO2 OR CARBON DIOXIDE
L6 (8483) SEA FILE=HCAPLUS ABB=ON L5(L) REM/RL
L7 (68271) SEA FILE=HCAPLUS ABB=ON L5(6A) GAS?
L8 (4157) SEA FILE=HCAPLUS ABB=ON L6 AND L7
L9 (648) SEA FILE=HCAPLUS ABB=ON L4 AND L8
L10 (85) SEA FILE=HCAPLUS ABB=ON L9 AND CARBONATE?
L11 (7219) SEA FILE=HCAPLUS ABB=ON L2(L) REM/RL
L12 (76) SEA FILE=HCAPLUS ABB=ON L10 AND L11
L13 (553636) SEA FILE=HCAPLUS ABB=ON L3
L14 (28) SEA FILE=HCAPLUS ABB=ON L12 AND L13
L15 (1831) SEA FILE=HCAPLUS ABB=ON (DEXTROSE OR GLYCINE OR GLUTAMIC OR GALACTOSE OR EDTA OR ACETIC ACID OR ARG OR ARGININE) (5A) WASTE?
L16 (7539) SEA FILE=HCAPLUS ABB=ON (TAURINE OR CACO3 OR CALCIUM CARBONATE OR MG2CO3 OR MAGNESIUM CARBONATE OR GLYCOGEN OR CHONROITIN SULFATE OR PHOSPHATE#) (5A) WASTE?
L17 (13) SEA FILE=HCAPLUS ABB=ON L12 AND (L15 OR L16)
L18 (39) SEA FILE=HCAPLUS ABB=ON L12 AND (HYDRAT? OR H2O OR AQ OR AQUEOUS OR WATER?)
L19 (7) SEA FILE=HCAPLUS ABB=ON L18 AND (SEQUESTER? OR EXTRACT?)
L20 (5) SEA FILE=HCAPLUS ABB=ON L18 AND FIX?
L21 (29) SEA FILE=HCAPLUS ABB=ON L18 AND (AIR(W) POLLUT?) /SC
L22 (46) SEA FILE=HCAPLUS ABB=ON L14 OR L17 OR L19 OR L20 OR L21
L23 (41) SEA FILE=HCAPLUS ABB=ON L22 AND AIR/SC, SX
L24 (2044) SEA FILE=HCAPLUS ABB=ON L4(6A) L5

KATHLEEN FULLER EIC 1700 REMSEN 4B28 571/272-2505

L25 (33) SEA FILE=HCAPLUS ABB=ON L23 AND L24
L26 (38237) SEA FILE=HCAPLUS ABB=ON WASTE GASES/IT
L27 (30) SEA FILE=HCAPLUS ABB=ON L25 AND L26
L28 (1) SEA FILE=HCAPLUS ABB=ON L25 AND CARBONIC
L29 (2) SEA FILE=HCAPLUS ABB=ON L18 AND CARBONIC
L30 (2) SEA FILE=HCAPLUS ABB=ON L12 AND CARBONIC
L31 (17) SEA FILE=HCAPLUS ABB=ON L9 AND BICARBONATE?
L32 (11) SEA FILE=HCAPLUS ABB=ON L11 AND L31
L33 (2) SEA FILE=HCAPLUS ABB=ON L32 AND CARBONIC
L34 (13) SEA FILE=HCAPLUS ABB=ON L31 AND (AQ OR AQUEOUS OR WATER? OR
H2O OR HYDRAT?)
L35 40 SEA FILE=HCAPLUS ABB=ON (L27 OR L28 OR L29 OR L30) OR L33 OR
L34

=> file wpix
FILE 'WPIX' ENTERED AT 09:57:08 ON 03 MAR 2004
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FILE LAST UPDATED: 2 MAR 2004 <20040302/UP>
MOST RECENT DERWENT UPDATE: 200415 <200415/DW>
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SDIS USING THE TIME RANGE CODE WILL NEED TO BE UPDATED.
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=> d que 151

L36 4062 SEA FILE=WPIX ABB=ON (CO2 OR CARBON DIOXIDE) (3A) (REMOV? OR
DISPOS?)
L37 18052 SEA FILE=WPIX ABB=ON (CO2 OR CARBON DIOXIDE) (3A) GAS?
L38 1653 SEA FILE=WPIX ABB=ON L36 AND L37
L40 224 SEA FILE=WPIX ABB=ON L38 AND (CARBONATE# OR BICARBONATE#)
L41 154 SEA FILE=WPIX ABB=ON L40 AND (H2O OR WATER? OR HYDRAT? OR AQ
OR AQUEOUS?)
L42 6 SEA FILE=WPIX ABB=ON L41 AND CARBONIC
L43 1680 SEA FILE=WPIX ABB=ON (CO2 OR CARBON DIOXIDE) (3A) (EXTRACT? OR
SEQUESTER? OR FIX?)
L44 340 SEA FILE=WPIX ABB=ON L37 AND L43
L45 62 SEA FILE=WPIX ABB=ON L44 AND (CARBONATE# OR BICARBONATE#)
L46 45 SEA FILE=WPIX ABB=ON L45 AND (H2O OR WATER? OR HYDRAT? OR AQ
OR AQUEOUS?)
L47 2 SEA FILE=WPIX ABB=ON L46 AND CARBONIC

L48 6 SEA FILE=WPIX ABB=ON L42 OR L47
L49 28 SEA FILE=WPIX ABB=ON (L46 OR L41) AND WASTE?
L50 8 SEA FILE=WPIX ABB=ON L49 AND B01D053?/IC
L51 13 SEA FILE=WPIX ABB=ON L48 OR L50

=> file compendex

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FILE COVERS 1970 TO DATE.

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THE BASIC INDEX >>>

=> d que 152

L36 4062 SEA FILE=WPIX ABB=ON (CO2 OR CARBON DIOXIDE) (3A) (REMOV? OR
DISPOS?)
L37 18052 SEA FILE=WPIX ABB=ON (CO2 OR CARBON DIOXIDE) (3A) GAS?
L38 1653 SEA FILE=WPIX ABB=ON L36 AND L37
L40 224 SEA FILE=WPIX ABB=ON L38 AND (CARBONATE# OR BICARBONATE#)
L41 154 SEA FILE=WPIX ABB=ON L40 AND (H2O OR WATER? OR HYDRAT? OR AQ
OR AQUEOUS?)
L42 6 SEA FILE=WPIX ABB=ON L41 AND CARBONIC
L43 1680 SEA FILE=WPIX ABB=ON (CO2 OR CARBON DIOXIDE) (3A) (EXTRACT? OR
SEQUESTER? OR FIX?)
L44 340 SEA FILE=WPIX ABB=ON L37 AND L43
L45 62 SEA FILE=WPIX ABB=ON L44 AND (CARBONATE# OR BICARBONATE#)
L46 45 SEA FILE=WPIX ABB=ON L45 AND (H2O OR WATER? OR HYDRAT? OR AQ
OR AQUEOUS?)
L47 2 SEA FILE=WPIX ABB=ON L46 AND CARBONIC
L52 0 SEA FILE=COMPENDEX ABB=ON L42 OR L47

=> file jicst

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FILE COVERS 1985 TO 1 MAR 2004 (20040301/ED)

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L36 4062 SEA FILE=WPIX ABB=ON (CO2 OR CARBON DIOXIDE) (3A) (REMOV? OR
DISPOS?)
L37 18052 SEA FILE=WPIX ABB=ON (CO2 OR CARBON DIOXIDE) (3A) GAS?
L38 1653 SEA FILE=WPIX ABB=ON L36 AND L37
L40 224 SEA FILE=WPIX ABB=ON L38 AND (CARBONATE# OR BICARBONATE#)
L41 154 SEA FILE=WPIX ABB=ON L40 AND (H2O OR WATER? OR HYDRAT? OR AQ
OR AQUEOUS?)
L42 6 SEA FILE=WPIX ABB=ON L41 AND CARBONIC
L43 1680 SEA FILE=WPIX ABB=ON (CO2 OR CARBON DIOXIDE) (3A) (EXTRACT? OR
SEQUESTER? OR FIX?)
L44 340 SEA FILE=WPIX ABB=ON L37 AND L43

L45 62 SEA FILE=WPIX ABB=ON L44 AND (CARBONATE# OR BICARBONATE#)
L46 45 SEA FILE=WPIX ABB=ON L45 AND (H2O OR WATER? OR HYDRAT? OR AQ
OR AQUEOUS?)
L47 2 SEA FILE=WPIX ABB=ON L46 AND CARBONIC
L48 6 SEA FILE=WPIX ABB=ON L42 OR L47
L49 28 SEA FILE=WPIX ABB=ON (L46 OR L41) AND WASTE?
L50 8 SEA FILE=WPIX ABB=ON L49 AND B01D053?/IC
L53 2 SEA FILE=JICST-EPLUS ABB=ON L48 OR L50

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FILE 'JAPIO' ENTERED AT 09:57:48 ON 03 MAR 2004
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FILE COVERS APR 1973 TO OCTOBER 31, 2003

<<< GRAPHIC IMAGES AVAILABLE >>>

=> d que 154
L36 4062 SEA FILE=WPIX ABB=ON (CO2 OR CARBON DIOXIDE) (3A) (REMOV? OR
DISPOS?)
L37 18052 SEA FILE=WPIX ABB=ON (CO2 OR CARBON DIOXIDE) (3A) GAS?
L38 1653 SEA FILE=WPIX ABB=ON L36 AND L37
L40 224 SEA FILE=WPIX ABB=ON L38 AND (CARBONATE# OR BICARBONATE#)
L41 154 SEA FILE=WPIX ABB=ON L40 AND (H2O OR WATER? OR HYDRAT? OR AQ
OR AQUEOUS?)
L42 6 SEA FILE=WPIX ABB=ON L41 AND CARBONIC
L43 1680 SEA FILE=WPIX ABB=ON (CO2 OR CARBON DIOXIDE) (3A) (EXTRACT? OR
SEQUESTER? OR FIX?)
L44 340 SEA FILE=WPIX ABB=ON L37 AND L43
L45 62 SEA FILE=WPIX ABB=ON L44 AND (CARBONATE# OR BICARBONATE#)
L46 45 SEA FILE=WPIX ABB=ON L45 AND (H2O OR WATER? OR HYDRAT? OR AQ
OR AQUEOUS?)
L47 2 SEA FILE=WPIX ABB=ON L46 AND CARBONIC
L48 6 SEA FILE=WPIX ABB=ON L42 OR L47
L49 28 SEA FILE=WPIX ABB=ON (L46 OR L41) AND WASTE?
L50 8 SEA FILE=WPIX ABB=ON L49 AND B01D053?/IC
L54 4 SEA FILE=JAPIO ABB=ON L48 OR L50

=> dup rem 135 151 152 153

L52 HAS NO ANSWERS
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PROCESSING COMPLETED FOR L51
PROCESSING COMPLETED FOR L52
PROCESSING COMPLETED FOR L53
L55 54 DUP REM L35 L51 L52 L53 (1 DUPLICATE REMOVED)

=> d all 155 1-54

L55 ANSWER 1 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2003-449241 [42] WPIX
DNC C2003-119246
TI Production of liquid **carbon dioxide** from combustion
gas at normal pressure, involves transferring carbon dioxide from
the normal pressure combustion gas to a **carbon**
dioxide concentrate at lower pressure and specified temperature.
DC E36 J01
IN NURMIA, M
PA (NURM-I) NURMIA M; (NURM-I) NURMIA W
CYC 101
PI WO 2003035221 A1 20030501 (200342)* EN 21p B01D053-14 <--
RW: AT BE BG CH CY CZ DE DK EA EE ES FI FR GB GH GM GR IE IT KE LS LU
MC MW MZ NL OA PT SD SE SK SL SZ TR TZ UG ZM ZW
W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ DE DK
DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR
KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ OM PH PL PT
RO RU SD SE SG SI SK SL TJ TM TN TR TT TZ UA UG US UZ VC VN YU ZA
ZM ZW
FI 2001005028 A 20030423 (200346) B01D053-14 <--
FI 111607 B1 20030829 (200364) B01D053-14 <--
ADT WO 2003035221 A1 WO 2002-FI814 20021021; FI 2001005028 A FI 2001-5028
20011022; FI 111607 B1 FI 2001-5028 20011022
FDT FI 111607 B1 Previous Publ. FI 2001005028
PRAI FI 2001-5028 20011022
IC ICM **B01D053-14**
ICS **B01D053-62**; C01B031-20
ICI B01D179:00
AB WO2003035221 A UPAB: 20030703
NOVELTY - Production of liquid **carbon dioxide** from
combustion gas at normal pressure involves transferring carbon
dioxide from the normal pressure combustion gas, using a nearly reversible
absorption and desorption process, to carbon dioxide concentrate at a
lower pressure and at 35-75 deg. C, such that absorption and desorption
take place at the same temperature without importing external heat to the
processes.
DETAILED DESCRIPTION - Production of liquid **carbon**
dioxide from combustion gas at normal pressure involves
absorbing in an absorption solution that flows downwards from its upper
part, the **carbon dioxide (CO₂)** of combustion
gas led to the lower part of an absorption column (11); and
removing the CO₂-poor combustion gas from the
upper part of the absorption column. The absorption solution is led to the
upper part of a desorption column (12). The CO₂ is desorbed from the
absorption solution led to the upper part of the desorption column to form
a **gaseous CO₂** concentrate, which is removed
from the upper part as the absorption solution flows to the lower part of
the column, from which it is recirculated to the upper part of the
absorption column. The CO₂ concentrate obtained is brought to a high
pressure, and most of the concentrate's CO₂ is liquidized. The CO₂ is
transferred from the normal-pressure combustion gas, using a nearly
reversible absorption and desorption process, to the CO₂ concentrate at a
lower pressure and at a temperature near to that of the combustion gas
being processed, preferably at 35-75 deg. C, such that the absorption and
desorption processes take place at the same temperature, preferably

without importing external heat to the processes.

USE - Production of liquid **carbon dioxide** from combustion **gas** at normal pressure.

ADVANTAGE - The process allows more energy-economical separation of carbon dioxide, compared to the prior art.

DESCRIPTION OF DRAWING(S) - The figure shows a schematic diagram of the process.

Absorption column 11

Desorption column 12

Liquidization column 18

Heat exchangers 19.1, 19.2, 19.3, 19.4

Cooling turbines 20.1, 20.2, 20.3

Cooling-expansion cycle 24

Dwg.1/2

FS CPI

FA AB; GI; DCN

MC CPI: E31-N05C; J01-E03C

L55 ANSWER 2 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 2003:627223 HCAPLUS

DN 139:353573

ED Entered STN: 15 Aug 2003

TI Ion Exchange Resins as Reversible Acid Gas Absorbents

AU Quinn, R.

CS Corporate Science and Technology Center, Air Products and Chemicals, Inc., Allentown, PA, 18195-1501, USA

SO Separation Science and Technology (2003), 38(14), 3385-3407
CODEN: SSTEDE; ISSN: 0149-6395

PB Marcel Dekker, Inc.

DT Journal

LA English

CC 59-4 (Air Pollution and Industrial Hygiene)

AB Strongly basic anion exchange resins containing quaternary ammonium functionality and fluoride or acetate anions were found to remove **carbon dioxide** and hydrogen sulfide from **gas** streams. The absorption/desorption isotherms, heats of absorption, and gas separation properties were determined for a series of such resins. The fluoride

form of Amberlyst A-26, for example, absorbed CO₂ and H₂S reversibly, 0.23 mol CO₂/mol F⁻ and 0.24 mol H₂S/mol F⁻ at 100 kPa and 22 and 30°C, resp. Absorption of CO₂ was fast compared to its desorption.

Characterization by NMR indicated that **bicarbonate** was formed by reaction of CO₂ with F⁻ containing resins. Heats of CO₂ absorption by F- Amberlyst A-26 were pressure dependent and ranged from -5.0 to -3.2 kcal/mol CO₂ for pressures of 50 to 1000 kPa. The fluoride and acetate containing resins were effective for removal of CO₂ and H₂S from **gas** mixts. Passage of a **gas** mixture containing 1% CO₂ or 5% H₂S through a packed column of F- Amberlyst A-26 at 22°C reduced the CO₂ or H₂S concentration to less than 25 ppm. Regeneration of the absorbents was accomplished by purging with inert **gas** at 50°C. Removal of CO₂ from **gas** streams containing substantial **water** vapor concns. was achieved using F- Amberlyst A-26 resin.

ST ion exchange resin reversible acid gas absorbent Amberlyst

IT **Waste gases**

(acidic; ion exchange resins as reversible acid gas absorbents)

IT Functional groups

(ammonio group; ion exchange resins as reversible acid gas absorbents)

IT Absorbents
Ion exchangers
(ion exchange resins as reversible acid gas absorbents)
IT 39339-85-0, Amberlyst A-26
RL: NUU (Other use, unclassified); USES (Uses)
(fluoride and acetate containing; ion exchange resins as reversible acid
gas absorbents)
IT 71-50-1, Acetate, uses 16984-48-8, Fluoride, uses
RL: MOA (Modifier or additive use); USES (Uses)
(ion exchange resins as reversible acid gas absorbents)
IT 37264-66-7, Amberlite ira910 39405-29-3, SP 2 53125-38-5, Dowex msal
59753-65-0, Diaion pa408
RL: NUU (Other use, unclassified); USES (Uses)
(ion exchange resins as reversible acid gas absorbents)
IT **124-38-9, Carbon dioxide**, processes
RL: PEP (Physical, engineering or chemical process); POL (Pollutant); PYP
(Physical process); REM (Removal or disposal); OCCU
(Occurrence); PROC (Process)
(ion exchange resins as reversible acid gas absorbents)

RE.CNT 25 THERE ARE 25 CITED REFERENCES AVAILABLE FOR THIS RECORD

RE

- (1) Albright, R; Encyclopedia of Polymer Science and Engineering 1987, V8, P341
- (2) Alovayainikov, A; Teor Prakt Sorbtzionnykh Protsessov 1980, V13, P99 HCPLUS
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L55 ANSWER 3 OF 54 HCPLUS COPYRIGHT 2004 ACS on STN

AN 2002:204634 HCPLUS

DN 136:236149

ED Entered STN: 19 Mar 2002

TI Chemical **fixation** of carbon dioxide as **carbonates** by
using amine

IN Shibata, Shunji; Yamamoto, Hideki

PA Kansai University, Japan

SO Jpn. Kokai Tokkyo Koho, 6 pp.

CODEN: JKXXAF

DT Patent

LA Japanese
 IC ICM B01D053-14
 ICS B01D053-14; B01D053-62; B01J019-00; C01B031-20
 CC 59-4 (**Air Pollution** and Industrial Hygiene)

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 2002079035	A2	20020319	JP 2000-268184	20000905
PRAI	JP 2000-268184		20000905		

AB The **fixation** of CO₂ is carried out by the following steps: (1) reacting amines with a salt-containing H₂O phase while CO₂ in a **gas** phase is brought in contact with the H₂O phase and (2) removing the resulting amine salts for producing **carbonates** by reaction between the remaining anions, which are originated from the salts in the H₂O phase, and the dissolved CO₂. In the step 1, the amines may be dissolved in an organic phase. After the **fixation**, the amine salts can be easily regenerated into amines by removing acids from the amine salts. CO₂ **gas** is absorbed and **fixed** in high efficiency with low energy consumption, and the obtained **carbonates** can be used as industrial raw materials. The **fixation** method is useful for treating **waste gas** from chemical factories, power plants, etc.

ST chem **fixation** carbon dioxide **carbonate** amine salt;
waste gas carbon dioxide removal
 chem **fixation** carbonate

IT **Waste gases**

(high-efficient chemical **fixation** of CO₂ as **carbonates** by using amine and salt-containing H₂O phase)

IT Amines, uses

RL: NUU (Other use, unclassified); USES (Uses)
 (high-efficient chemical **fixation** of CO₂ as **carbonates** by using amine and salt-containing H₂O phase)

IT 144-55-8P, Sodium hydrogen **carbonate**, uses
 RL: IMF (Industrial manufacture); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
 (high-efficient chemical **fixation** of CO₂ as **carbonates** by using amine and salt-containing H₂O phase)

IT 7647-14-5, Sodium chloride, uses

RL: NUU (Other use, unclassified); USES (Uses)
 (high-efficient chemical **fixation** of CO₂ as **carbonates** by using amine and salt-containing H₂O phase)

IT 124-38-9, Carbon oxide (CO₂), reactions

RL: RCT (Reactant); REM (**Removal or disposal**); PROC (Process);
 RACT (Reactant or reagent)
 (high-efficient chemical **fixation** of CO₂ as **carbonates** by using amine and salt-containing H₂O phase)

L55 ANSWER 4 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2002-414605 [44] WPIX

DNC C2002-117057

TI Simultaneous reduction of carbon dioxide and sulfur dioxide emissions by injecting calcium-based agent into hearth, subjecting flue gases to intermediate cooling, carbonizing, and extracting solids contained in the flue gases.

DC J01 Q73

IN BEAL, C; MORIN, J; VANDYCKE, M; MORIN, J X

PA (ALSM) ALSTOM POWER NV; (ALSM) ALSTOM

CYC 27

PI US 2002037246 A1 20020328 (200244)* 4p B01D053-50 <--
 EP 1193444 A1 20020403 (200244) FR F23J007-00
 R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT
 RO SE SI TR

FR 2814533 A1 20020329 (200244) F23J007-00

ADT US 2002037246 A1 US 2001-951389 20010914; EP 1193444 A1 EP 2001-402311
 20010906; FR 2814533 A1 FR 2000-12288 20000927

PRAI FR 2000-12288 20000927

IC ICM B01D053-50; F23J007-00
 ICS B01D053-14; B01D053-62; B01J020-04; B01J020-34;
 F23C010-00; F23J015-00

ICA F23G005-30; F23G005-46

AB US2002037246 A UPAB: 20020711

NOVELTY - Simultaneous reduction of carbon dioxide and sulfur dioxide emissions involves injecting into a hearth a calcium-based agent; subjecting the flue gases to intermediate cooling, causing them to transit via a first reactor, and putting them in contact with the other fraction of the absorbent that has not reacted with sulfur dioxide; and extracting solids contained in the flue gases.

DETAILED DESCRIPTION - Simultaneous reduction of carbon dioxide (CO₂) and sulfur dioxide (SO₂) emissions produced by the combustion of carbon-containing matter in a hearth (1) involves injecting into the hearth a calcium-based agent (2), a fraction of which absorbs SO₂ after decarbonization; subjecting the flue gases to intermediate cooling, causing them to transit via a first reactor (4), and putting them in contact with the other fraction of the absorbent that has not reacted with SO₂ to capture CO₂ from the flue **gases** by carbonization; and in a separator (6), extracting the solids contained in the flue gases output from the first reactor to subject them to heat treatment in a second reactor (11) to **extract** CO₂ by decarbonization and to recycle the resulting regenerated CO₂ absorbent to the first reactor.

USE - The method is used for simultaneously reducing carbon dioxide and sulfur dioxide emissions produced by the combustion of carbon-containing matter, e.g. fossil fuels or **waste**, in a hearth.

ADVANTAGE - The inventive method provides effective desulfurization of the flue gases.

DESCRIPTION OF DRAWING(S) - The figure shows the inventive method.

Hearth 1

Calcium-based agent 2

First reactor 4

Separator 6

Dust filter 9

Second reactor 11

Heat exchanger 18

Dwg.1/1

FS CPI GMPI

FA AB; GI

MC CPI: J01-E02B

L55 ANSWER 5 OF 54 HCPLUS COPYRIGHT 2004 ACS on STN

AN 2001:693790 HCPLUS

DN 135:261506

ED Entered STN: 21 Sep 2001

TI Method and apparatus for **extracting** and **sequestering**
 carbon dioxide

applicants

IN Rau, Gregory H.; Caldeira, Kenneth G.
PA Rau, Gregory, USA
SO U.S. Pat. Appl. Publ., 23 pp., Cont.-in-part of U.S. Ser. No. 314,220,
abandoned.
CODEN: USXXCO
DT Patent
LA English
IC ICM B01D053-34
ICS B01J008-00
NCL 422169000
CC 59-4 (**Air Pollution** and Industrial Hygiene)
Section cross-reference(s): 61

FAN.CNT 2

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 2001022952	A1	20010920	US 2001-759781	20010116
PRAI	US 1998-96846P	P	19980818		
	US 1999-314220	B2	19990519		

AB A method and apparatus to **extract** and **sequester** carbon dioxide (CO₂) from a stream or volume of **gas** wherein said method and apparatus **hydrates** CO₂, and reacts the resulting **carbonic** acid with **carbonate**. Suitable **carbonates** include, but are not limited to, **carbonates** of alkali metals and alkaline earth metals, preferably **carbonates** of calcium and magnesium. Waste products are metal cations and **bicarbonate** in solution or dehydrated metal salts, which when disposed of in a large body of **water** provide an effective way of **sequestering** CO₂ from a **gaseous** environment.

ST carbon dioxide removal **waste gas**
sequestering seawater 4512367 7612345

IT **Bicarbonates**
RL: FMU (Formation, unclassified); REM (Removal or disposal);
FORM (Formation, nonpreparative); PROC (Process)
(alkali metals and alkaline earth metals; method and apparatus for **extg**
. and **sequestering carbon dioxide** from
waste gases)

IT **Carbonates, uses**
RL: NUU (Other use, unclassified); USES (Uses)
(alkali metals and alkaline earth metals; method and apparatus for **extg**
. and **sequestering carbon dioxide** from
waste gases)

IT Carboxylic acids, uses
RL: NUU (Other use, unclassified); USES (Uses)
(aromatic; method and apparatus for **extracting** and **sequestering**
carbon dioxide from **waste gases**)

IT Alkali metals, uses
Alkaline earth metals
RL: NUU (Other use, unclassified); USES (Uses)
(**carbonates**; method and apparatus for **extracting** and
sequestering carbon dioxide from
waste gases)

IT **Waste gases**
(method and apparatus for **extracting** and **sequestering**
carbon dioxide from **waste gases**)

IT Humus
Metals, uses
RL: NUU (Other use, unclassified); USES (Uses)
(method and apparatus for **extracting** and **sequestering**

carbon dioxide from waste gases)

- IT Glycoproteins, general, uses
 RL: NUU (Other use, unclassified); USES (Uses)
 (succinate; method and apparatus for **extracting** and
sequestering carbon dioxide from
waste gases)
- IT 50-99-7, Dextrose, uses 56-40-6, Glycine, uses
 56-86-0, L-Glutamic acid, uses 59-23-4, Galactose, uses
 60-00-4, EDTA, uses 64-19-7, Acetic acid, uses
 74-79-3, Arginine, uses 77-92-9, uses 97-67-6
 107-35-7, Taurine 127-17-3, uses 471-34-1,
 Calcium **carbonate**, uses 546-93-0, Magnesium
carbonate 556-50-3 9005-79-2, Glycogen, uses
 9007-28-7, Chondroitin sulfate 14265-44-2, Phosphate,
 uses 22537-22-0, Magnesium 2+, uses
 RL: NUU (Other use, unclassified); USES (Uses)
 (method and apparatus for **extracting** and **sequestering**
carbon dioxide from waste gases)
- IT 124-38-9, Carbon **dioxide**, processes
 RL: REM (Removal or disposal); PROC (Process)
 (method and apparatus for **extracting** and **sequestering**
carbon dioxide from waste gases)
- L55 ANSWER 6 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
 AN 2001-138271 [14] WPIX
 DNC C2001-040771
- TI Solid sorbent composition useful for the **removal** of
carbon dioxide and other acidic components is formed by
 the reaction of at least one liquid absorbent material with a hardener.
- DC E36 J01
- IN AFREMOV, L; BRANOVER, Y; LESIN, S; PIPKO, G; SINATOV, S
 PA (SOLM-N) SOLMECS ISRAEL LTD
- CYC 94
- PI WO 2001003827 A1 20010118 (200114)* EN 17p B01J020-04
 RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW MZ
 NL OA PT SD SE SL SZ TZ UG ZW
 W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CR CU CZ DE DK DM
 DZ EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC
 LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ PL PT RO RU SE SG
 SI SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW
 AU 2000055618 A 20010130 (200127) B01J020-04
 US 2002147109 A1 20021010 (200269) B01J020-22
- ADT WO 2001003827 A1 WO 2000-IL385 20000703; AU 2000055618 A AU 2000-55618
 20000703; US 2002147109 A1 US 2002-42387 20020111
- FDT AU 2000055618 A Based on WO 2001003827
- PRAI IL 1999-130882 19990711
- IC ICM B01J020-04; B01J020-22
 ICS **B01D053-62**; B01J020-06; B01J020-30
- AB WO 200103827 A UPAB: 20010312
 NOVELTY - A solid sorbent composition is formed by the reaction of at
 least one liquid absorbent material (1) with at least one hardener. (1) is
 capable of absorbing carbon dioxide and other acidic components.
 DETAILED DESCRIPTION - INDEPENDENT CLAIMS are included for :
 (a) use of the composition for **removal** of **carbon**
dioxide from a **gaseous** stream. The solid sorbent is
 introduced into the stream at a temperature lower than 80 deg. C
 (preferably 60 deg. C) and upon saturation of the sorbent with carbon
 dioxide, the solid sorbent is reheated above 85 deg. C (preferably 65 deg.

C) at which carbon dioxide is released, thus enabling the recycling of the solid sorbent for reintroduction into the gaseous stream; and
 (b) preparation of the solid sorbent composition involving
 (1) mixing at least one (1) with at least one hardener;
 (2) heating the mixture of step (i) to 100 deg. C to effect a chemical reaction between the components of the mixture with the formation of a reaction product;
 (3) processing the product of step (ii) into a granulated form; and
 (4) drying the granulated sorbent.

USE - For the **removal of carbon dioxide** and other acidic components such as SO₂, H₂S, HCl, NO₂ from the gaseous stream (claimed).

ADVANTAGE - The composition utilizes inexpensive sorbent and simple equipment, involves possible recovery of low temperature **waste** heat for regeneration of sorbent, provides a higher chemical reaction rate, a higher adsorptive capability which allows the use of less sorbent material. The use of smaller amounts of the sorbents in addition to the narrow temperature range of the reversible chemical reaction allows for conservation of energy and the elimination of damaging effects to the sorbent in the presence of **water** vapor. The composition is environmental friendly.

Dwg.0/0

FS CPI
 FA AB; DCN
 MC CPI: E10-B03B; E11-Q02; E31-B03D; E31-F01A; E31-F01B; E31-H02; E31-N05C; E33-A03; E33-D; E34; E34-B01; E34-C02; E35-C; J01-E02B

L55 ANSWER 7 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
 AN 2001-243306 [25] WPIX
 DNC C2001-072913

TI Removal of sulfur dioxide and **carbon dioxide** from **gases** coming from coal fired boilers involves contacting gases with **aqueous** solution of dimethyl sulfoxide.

DC E36 J01
 IN KIRSCHNER, L
 PA (KIRS-I) KIRSCHNER L
 CYC 1

PI US 6187277 B1 20010213 (200125)* 9p B01D053-50 <--

ADT US 6187277 B1 US 1999-325955 19990604

PRAI US 1999-325955 19990604

IC ICM **B01D053-50**

ICS **B01D053-62**

AB US 6187277 B UPAB: 20010508

NOVELTY - Sulfur dioxide (SO₂) and **carbon dioxide** (CO₂) are **removed** from a gas by dissolving SO₂ and CO₂ in an **aqueous** solution of dimethyl sulfoxide at a pH less than 7. The dissolved gases are reacted with alkaline earth metal ions, and the reaction products are separated from the solution.

DETAILED DESCRIPTION - **Removal** of SO₂ and (CO₂) from a **gas** involves contacting the gas with an **aqueous** solution of dimethyl sulfoxide (DMSO) at a pH less than 7 to dissolve SO₂ and CO₂ in the DMSO solution, reacting the dissolved SO₂ and CO₂ with alkaline earth metal ions, and separating the reaction products from the DMSO solution. SO₂ reacts with the alkaline earth metal ions to form solid alkaline earth sulfate and/or alkaline earth sulfite, while CO₂ reacts to form solid alkaline earth **carbonate**.

USE - The method is used for clean air technologies. It is particularly useful for removing sulfur dioxide from stack gases coming

from fossil fuel fired boilers (e.g., coal fired boilers).

ADVANTAGE - The process results to an almost 100% removal of sulfur dioxide. Use of DMSO provides continuous CO₂ fire retardant atmosphere, which add a significant safety factor to the process. DMSO can be recovered unchanged when required.

Dwg.0/2

FS CPI

FA AB; DCN

MC CPI: E10-A10A; E11-Q02; E31-F01A; E31-N05C; J01-E02

L55 ANSWER 8 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2001-309821 [33] WPIX

CR 2001-114323 [13]

DNN N2001-221816 DNC C2001-095852

TI Suppressed ion chromatography comprises reducing **carbonic acid** formed during mobile phase suppression, by **removing carbon dioxide**.

DC J04 S03

IN ANDERSON, J M; BENEDICT, B C; GURNER, Y; PHAM, H A; SAARI-HORDHAUS, R; SIMS, C W; SAARI-NORDHAUS, R

PA (ALLT-N) ALLTECH ASSOC INC

CYC 28

PI EP 1092977 A1 20010418 (200133)* EN 24p G01N030-96

R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT
RO SE SI

AU 2000066490 A 20010426 (200134) B01D015-08

CA 2323287 A1 20010413 (200137) EN G01N030-96

JP 2001194353 A 20010719 (200145) 52p G01N030-02

ADT EP 1092977 A1 EP 2000-122480 20001013; AU 2000066490 A AU 2000-66490
20001013; CA 2323287 A1 CA 2000-2323287 20001013; JP 2001194353 A JP
2000-351939 20001013

PRAI US 1999-417231 19991013

IC ICM B01D015-08; G01N030-02; G01N030-96

ICS G01N030-14

AB EP 1092977 A UPAB: 20020924

NOVELTY - Suppressed ion chromatography comprises (a) chromatographically separating analyte ions in an **aqueous** mobile phase comprising a cation **carbonate/bicarbonate**, (b) suppressing the mobile phase to form dissolved **carbonic acid** and **carbon dioxide gas** in equilibrium; (c) reducing the amount of **carbonic acid** by **removing carbon dioxide**, and (d) detecting the separated analyte ions.

USE - For detecting analyte ions.

ADVANTAGE - The reduced amount of **carbonic acid** reduces background noise, which interferes with the detection of sample ions. The suppressed chromatography effluent can be converted back to its strongly ionized state, thus the mobile phase can be recycled and reused.

Dwg.0/14

FS CPI EPI

FA AB

MC CPI: J04-B01C

EPI: S03-E09C5

L55 ANSWER 9 OF 54 JICST-EPlus COPYRIGHT 2004 JST on STN

AN 1020072761 JICST-EPlus

TI Size Control of Basic Magnesium **Carbonate** Particles by Reactive Crystallization.

AU TSUGE HIDEKI; TAKAHASHI YUJI; FUJIWARA EIJI

CS Keio Univ., Fac. of Sci. and Technol.
SO Nippon Kaisui Gakkaishi (Bulletin of the Society of Sea Water Science, Japan), (2001) vol. 55, no. 6, pp. 408-418. Journal Code: F0235A (Fig. 9, Tbl. 2, Ref. 4)
CODEN: NKAGBU; ISSN: 0369-4550
CY Japan
DT Journal; Article
LA Japanese
STA New
AB To utilize magnesium in seawater and **fix carbon dioxide** in exhausted **gases**, the direct carbonation method has been used to precipitate basic magnesium **carbonate** (BMC). BMC particles are used as a filler or anticaking agent for NaCl, which means it is necessary to control the size of BMC particles according to production needs. The aims of this study are to clarify the mechanism of reactive crystallization of BMC in the direct carbonation method, and to control the particle size of BMC. BMC particles were produced in a gas blowing stirred tank crystallizer through a reaction between carbon dioxide and a suspended **aqueous** solution of magnesium hydroxide. The particles obtained were analyzed by means of X-ray diffraction and photographs were taken with a scanning electron microscope. In this study, a mixture of spherical and tabular BMC particles was obtained. Agglomeration between particles was not observed very much during the growth of BMC. The particle size of BMC was influenced by the initial concentration and particle size of magnesium hydroxide, and the reaction temperature. By changing the initial concentration of magnesium hydroxide and the reaction temperature, it was possible to control the particle size of BMC to between 4-9Mm. (author abst.)
CC XD02070T; YB02060D (66.065.5; 661.66)
CT magnesium **carbonate**; magnesium hydroxide; suspension(disperse system); gas-liquid-solid reaction; crystallization; sea **water**; particle size(diameter); bubble column; basic salt; reaction control; hydrogen ion concentration; temperature dependence; concentration dependence; scanning electron microscope; X-ray diffraction; suspended solids; carbon dioxide
BT **carbonate**(salt); carbon oxoate; oxoate; oxygen compound; oxygen group element compound; carbon compound; carbon group element compound; magnesium compound; alkaline earth metal compound; hydroxide; hydrogen compound; disperse system; heterogeneous reaction; chemical reaction; modification; **water**; diameter; length; geometric quantity; chemical equipment; equipment; salt; control; acidity; degree; concentration(ratio); dependence; electron microscope; microscope; X-ray scattering; electromagnetic wave scattering; scattering; diffraction; coherent scattering; matter; carbon oxide; oxide; chalcogenide
ST reactive crystallization; suspended solid; grain size control; **carbonic** acid gas
L55 ANSWER 10 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN DUPLICATE 1
AN 2000:144792 HCAPLUS
DN 132:184778
ED Entered STN: 03 Mar 2000
TI Method and apparatus for extracting and sequestering carbon dioxide
IN Rau, Gregory Hudson; Caldeira, Kenneth George
PA United States Department of Energy, USA
SO PCT Int. Appl., 36 pp.
CODEN: PIXXD2
DT Patent
LA English

IC ICM B01D053-62

CC 59-4 (Air Pollution and Industrial Hygiene)

FAN.CNT 2

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE				
PI	WO 2000010691	A1	20000302	WO 1999-US18711	19990818				
	W: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM RW: GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG								
	AU 9955680	A1	20000314	AU 1999-55680	19990818				
PRAI	US 1998-96846P	P	19980818						
	US 1999-314220	A	19990519						
	WO 1999-US18711	W	19990818						
AB	A method and apparatus to extract and sequester carbon dioxide from a stream or volume of gas wherein said method and apparatus hydrates CO₂ , and reacts the resulting carbonic acid with carbonate . Suitable carbonates include, but are not limited to, carbonates of alkali metals and alkaline earth metals, preferably carbonates of calcium and magnesium. Waste products are metal cations and bicarbonate in solution, providing an effective way of sequestering CO₂ from a gaseous environment.								
ST	carbon dioxide removal gas sequestration								
IT	Limestone, uses								
	RL: MSC (Miscellaneous); NUU (Other use, unclassified); USES (Uses) (decarbonation; method and apparatus for extracting and sequestering carbon dioxide from gases)								
IT	Cement (construction material)								
	Flue gases								
	Waste gases								
	(method and apparatus for extracting and sequestering carbon dioxide from gases)								
IT	Lime (chemical)								
	RL: MSC (Miscellaneous)								
	(method and apparatus for extracting and sequestering carbon dioxide from gases)								
IT	60-00-4, EDTA, uses 471-34-1, Calcium Carbonate , uses 546-93-0, Magnesium Carbonate 13397-24-5, Gypsum, uses 13397-26-7, Calcite, uses 14791-73-2, Aragonite 16389-88-1, Dolomite, uses								
	RL: NUU (Other use, unclassified); USES (Uses) (method and apparatus for extracting and sequestering carbon dioxide from gases)								
IT	124-38-9, Carbon dioxide , processes								
	RL: REM (Removal or disposal); PROC (Process)								
	(method and apparatus for extracting and sequestering carbon dioxide from gases)								
RE.CNT	10	THERE ARE 10 CITED REFERENCES AVAILABLE FOR THIS RECORD							
RE									
(1)	Berthold, K; US 3988422 A 1976 HCPLUS								
(2)	Frevel, L; US 3660023 A 1972 HCPLUS								
(3)	Fuchs, W; US 3511595 A 1970 HCPLUS								
(4)	Hitachi Ltd; EP 0487102 A 1992 HCPLUS								

- (5) Imperial Chemical; GB 1305718 A 1973 HCPLUS
- (6) Metallgesellschaft; GB 819215 A 1959 HCPLUS
- (7) Rimpf, P; US 4187279 A 1980 HCPLUS
- (8) Sears, J; US 4510124 A 1985 HCPLUS
- (9) Stewart, R; GB 2284203 A 1995
- (10) Wilson, H; US 5584905 A 1996 HCPLUS

L55 ANSWER 11 OF 54 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 2000:339533 HCPLUS
 DN 132:338646
 ED Entered STN: 23 May 2000
 TI Method for **fixation** of dioxide carbon in **waste gases** or polluted air
 IN Watanabe, Miki; Maenami, Hiroki; Shin, Hirohito; Hisano, Hiroaki; Nishino, Tadashi
 PA Inax Corp., Japan; Foundation for Scientific Technology Promotion
 SO Jpn. Kokai Tokkyo Koho, 9 pp.
 CODEN: JKXXAF
 DT Patent
 LA Japanese
 IC ICM B01J039-04
 ICS B01J019-00; B01J049-00; C01B031-20; C01F011-18
 CC 59-4 (**Air Pollution** and Industrial Hygiene)
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 2000140651	A2	20000523	JP 1998-316398	19981106
PRAI	JP 1998-316398		19981106		
AB	The title method comprises adding a waste mortar powder containing alkaline earth				

metal ions (especially, Ca²⁺) into a 1st reaction solution mainly containing **water** in the presence of cation-exchange resin to adsorb alkaline earth metal ions from the waste mortar powder, regenerating the spent cation exchange resin in a 2nd reaction solution mainly containing **water** at controlled pH ≥10 for separating and **extracting** the alkaline earth metal ions, and then bubbling of the 2nd reaction solution with CO₂ from **waste gases** or air to form alkaline earth metal **carbonates** (especially, CaCO₃). The 2nd reaction solution may contain ≥1 alkali compds. such as NH₄OH, NaOH, diethylamine, diethylenetriamine, ethylenediamine, and/or trimethanolamine.

ST **fixation** dioxide carbon air ion exchange pptn; **waste gas carbon dioxide fixation** cation exchange

IT Air purification
 (fixation of dioxide carbon in polluted air by ion exchange and precipitation)

IT **Waste gases**
 (fixation of dioxide carbon in **waste gases** by ion exchange and precipitation)

IT 107-15-3, Ethylenediamine, processes 109-89-7, Diethylamine, processes 111-40-0, Diethylenetriamine 1310-73-2, Sodium hydroxide, processes 1336-21-6, Ammonium hydroxide 14002-32-5, Trimethanolamine
 RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
 (alkali agent; in **fixation** of dioxide carbon in **waste gases** or polluted air by ion exchange and precipitation)

IT 54693-44-6, Diaion SK
 RL: PEP (Physical, engineering or chemical process); TEM (Technical or

engineered material use); PROC (Process); USES (Uses)
 (fixation of dioxide carbon in polluted air by ion exchange
 and precipitation)

- IT 471-34-1P, Calcium **carbonate**, preparation
 RL: BYP (Byproduct); PUR (Purification or recovery); PREP (Preparation)
 (method for fixation of dioxide carbon in **waste gases** or polluted air by ion exchange and precipitation)
- IT 124-38-9, Carbon dioxide, processes
 RL: POL (Pollutant); REM (**Removal or disposal**); OCCU (Occurrence); PROC (Process)
 (method for fixation of dioxide carbon in **waste gases** or polluted air by ion exchange and precipitation)

L55 ANSWER 12 OF 54 HCPLUS COPYRIGHT 2004 ACS on STN

AN 2000:37706 HCPLUS

DN 132:82758

ED Entered STN: 18 Jan 2000

TI Porous agents for **waste gas** treatment and their manufacture

IN Kashiwagi, Yoshiyuki; Ishigaki, Haruhisa; Yoshioka, Nobuyuki

PA Meidensha Electric Mfg. Co., Ltd., Japan

SO Jpn. Kokai Tokkyo Koho, 9 pp.

CODEN: JKXXAF

DT Patent

LA Japanese

IC ICM B01D053-68

ICS B01J020-04

CC 59-4 (Air Pollution and Industrial Hygiene)

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 2000015055	A2	20000118	JP 1998-183530	19980630
PRAI	JP 1998-183530		19980630		

AB The title agent consists of alkaline substances containing gasifying components,

which are separated by heating to increase the sp. surface of the agent. The **gasifying** component may give CO₂ and H₂O. The alkaline substance may contain alkali metal compds. such as NaHCO₃, Na sesquicarbonate, and/or KHCO₃. The agent is manufactured by heating the gasifying component-containing alkaline substance above, preferably with indirect

heating, elec. heating, and/or microwave heating. The agent is useful for prevention of generation of dioxins and Cl gases from incinerator flue gases.

ST alkali metal heating flue gas treatment

IT Electric heating

Heating

Microwave heating

(heating in manufacture of **gasifying** CO₂- and H₂O-containing porous alkaline substance for generation prevention of HCl and dioxin from incinerator flue gas)

IT Alkali metal compounds

RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)

(heating in manufacture of **gasifying** CO₂- and H₂O-containing porous alkaline substance for generation prevention of HCl and dioxin from incinerator flue gas)

IT Flue **gases**

- (incinerator; heating in manufacture of **gasifying CO₂**- and H₂O-containing porous alkaline substance for generation prevention of HCl and dioxin from incinerator flue gas)
- IT 262-12-4D, Dibenzo[b,e][1,4]dioxin, chloro derivs.
 RL: **REM (Removal or disposal)**; PROC (Process)
 (PCDD; heating in manufacture of **gasifying CO₂**- and H₂O-containing porous alkaline substance for generation prevention of HCl and dioxin from incinerator flue gas)
- IT 124-38-9, **Carbon dioxide**, processes 7732-18-5,
Water, processes
 RL: PEP (Physical, engineering or chemical process); PROC (Process)
 (heating in manufacture of **gasifying CO₂**- and H₂O-containing porous alkaline substance for generation prevention of HCl and dioxin from incinerator flue gas)
- IT 144-55-8, Sodium **bicarbonate**, uses 298-14-6, Potassium **bicarbonate** 533-96-0, Sodium sesquicarbonate
 RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
 (heating in manufacture of **gasifying CO₂**- and H₂O-containing porous alkaline substance for generation prevention of HCl and dioxin from incinerator flue gas)
- IT 132-64-9D, Dibenzofuran, chloro derivs. 1746-01-6, TCDD 7647-01-0,
 Hydrogen chloride, processes
 RL: **REM (Removal or disposal)**; PROC (Process)
 (heating in manufacture of **gasifying CO₂**- and H₂O-containing porous alkaline substance for generation prevention of HCl and dioxin from incinerator flue gas)
- L55 ANSWER 13 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
 AN 1999:633377 HCAPLUS
 DN 131:247591
 ED Entered STN: 06 Oct 1999
 TI Method and apparatus for refining **waste gas** for recovering fuel
 IN Nakamura, Takeshi; Tanjo, Tetsuo; Kasai, Takeshi
 PA Kyoritsu K. K., Japan; Sankyo Process Service K. K.
 SO Jpn. Kokai Tokkyo Koho, 9 pp.
 CODEN: JKXXAF
 DT Patent
 LA Japanese
 IC ICM B01D053-52
 ICS B01D053-58; B01D053-04; B01D053-14; B01D053-68; B01D053-77
 CC 59-4 (**Air Pollution** and Industrial Hygiene)
 Section cross-reference(s): 52, 60
 FAN.CNT 1
- | | PATENT NO. | KIND | DATE | APPLICATION NO. | DATE |
|------|---------------|------|----------|-----------------|----------|
| PI | JP 11267450 | A2 | 19991005 | JP 1998-78082 | 19980325 |
| PRAI | JP 1998-78082 | | 19980325 | | |
- AB A **waste gas** containing a fuel **gas** such as CH₄ together with CO₂ and impurities such as HS, HCl, cyanide gas, NH₃, etc. is successively treated with an **aqueous** solution containing amines, an **aqueous** solution containing alkali **carbonates** and alkali hydrogen **carbonates**, and an **aqueous** solution containing phenols, xenols, or amino acids at pH ≤ 9.0 of resp. solns. to selectively adsorb and remove the impurities and to suppress the impurities to resp. prescribed concentration levels. The apparatus for the method

comprises an absorption tower, treatment solution supplying means for sep. supplying resp. solns., and recovering and treating means for recovering and treating the resp. solns. to make the solns. repeatedly usable. The absorption tower is a counterflow type. The method and the apparatus are for recovering a pure fuel **gas** from **waste gases** from coke-fueled furnaces, industrial plants, bioreactor fermentation tanks, and the likes.

ST refuse derived fuel purifn impurity absorption; combustion gas methane recovery recycling fuel

IT Amines, processes
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(acidic impurity gas removal by; methane-based fuel gas recovery from combustion **gases** and **waste gases** by removing impurity **gases** by absorption solns.)

IT Phenols, processes
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(ammonia removal by; methane-based fuel gas recovery from combustion **gases** and **waste gases** by removing impurity **gases** by absorption solns.)

IT Bioreactors
(biogas from; methane-based fuel gas recovery from combustion **gases** and **waste gases** by removing impurity **gases** by absorption solns.)

IT Fuel **gases**
(biogas, as **waste gases**; methane-based fuel gas recovery from combustion **gases** and **waste gases** by removing impurity **gases** by absorption solns.)

IT Alkali metal compounds
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**carbonates** and hydrogen **carbonates**, cyanides and acidic gas removal by; methane-based fuel gas recovery from combustion **gases** and **waste gases** by removing impurity **gases** by absorption solns.)

IT Furnaces
(coke-fueled, combustion gas from; methane-based fuel gas recovery from combustion **gases** and **waste gases** by removing impurity **gases** by absorption solns.)

IT pH
(control of, in **waste gas** treatment; methane-based fuel gas recovery from combustion **gases** and **waste gases** by removing impurity **gases** by absorption solns.)

IT Refuse derived fuels
(methane as; methane-based fuel gas recovery from combustion **gases** and **waste gases** by removing impurity **gases** by absorption solns.)

IT Combustion gases
(methane-based fuel gas recovery from combustion **gases** and **waste gases** by removing impurity **gases** by absorption solns.)

IT Fermentation
(of refuse, **waste gas** from; methane-based fuel gas recovery from combustion **gases** and **waste**

- gases by removing impurity gases by absorption solns.)
- IT Recycling
 (of waste gases as fuel gas;
 methane-based fuel gas recovery from combustion gases and waste gases by removing impurity gases by absorption solns.)
- IT Cyanides (inorganic), processes
 RL: PEP (Physical, engineering or chemical process); POL (Pollutant); REM (Removal or disposal); OCCU (Occurrence); PROC (Process)
 (removal of; methane-based fuel gas recovery from combustion gases and waste gases by removing impurity gases by absorption solns.)
- IT 108-95-2, Phenol, processes 1322-20-9, Phenylphenol
 RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
 (ammonia removal by; methane-based fuel gas recovery from combustion gases and waste gases by removing impurity gases by absorption solns.)
- IT 74-82-8P, Methane, preparation
 RL: PUR (Purification or recovery); PREP (Preparation)
 (methane-based fuel gas recovery from combustion gases and waste gases by removing impurity gases by absorption solns.)
- IT 124-38-9, Carbon dioxide, processes
 7647-01-0, Hydrochloric acid, processes 7664-41-7, Ammonia, processes
 7783-06-4, Hydrogen sulfide, processes
 RL: PEP (Physical, engineering or chemical process); POL (Pollutant);
REM (Removal or disposal); OCCU (Occurrence); PROC (Process)
 (removal of; methane-based fuel gas recovery from combustion gases and waste gases by removing impurity gases by absorption solns.)

L55 ANSWER 14 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
 AN 2000:425468 HCAPLUS
 DN 133:21611
 ED Entered STN: 26 Jun 2000
 TI Decarbonization, desulfurization, and decyanation catalytic process for industrial waste gas using Fe-alkali solution
 IN Wei, Xionghui; Zou, Meihua; Wei, Fenghui
 PA Peop. Rep. China
 SO Faming Zhuanli Shenqing Gongkai Shuomingshu, 17 pp.
 CODEN: CNXXEV
 DT Patent
 LA Chinese
 IC ICM B01D053-79
 ICS B01D053-90; B01D053-46
 CC 59-5 (**Air Pollution** and Industrial Hygiene)
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	CN 1227135	A	19990901	CN 1999-100596	19990205
	CN 1092994	B	20021023		

PRAI CN 1999-100596 19990205

AB S, HCN, and CO₂ are removed from industrial waste gas by using Fe-alkali solution, and the Fe-alkali solution is regenerated by oxidizing with O₂ and treating with NaOH. The Fe-alkali solution is prepared from Fe compound, Na₂CO₃, hydroquinone, and water.

The **waste gas** is treated with the above solution at 30-90° and 1.0-5.0 MPa, and the solution is regenerated at 90-130° and 0.05-0.3 MPa when the **waste gas** contains 20 ltoreq.CO2.ltoreq.100, S≤0.07, and HCN≤0.001 vol%; the solution (pH 3-11.5) contains Na+ ≤6.0, Fe ion ≤0.5, and hydroquinone ≤0.15M. The **waste gas** is treated at 30-60° and 0.3-2.0 MPa, and the solution is regenerated at 35-120° when the **waste gas** contains 10.ltoreq.CO2.ltoreq.20, S≤0.1, and HCN≤0.04 vol%; the solution (pH 3-12) contains Na+ ≤2.5, Fe ion ≤1.0, and hydroquinone ≤0.25M. The **waste gas** is treated at 30-60°, and the solution is regenerated at 35-80° when the **waste gas** contains CO2 ≤10, S≤0.1, and HCN≤0.04 vol%; the solution (pH 4-12) contains Na+ ≤1.5, Fe ion ≤2.1, and hydroquinone ≤0.25M. Na2CO3 can be substituted by K2CO3, Na3PO4, K3PO4, Na3BO3, K3BO3, Na3AsO4, K3AsO4, or alc. amine. Hydroquinone can be substituted by tanning **extract**

- ST **waste gas** decarbonization iron alkali soln;
desulfurization **waste gas** iron alkali soln;
decyanation **waste gas** iron alkali soln
- IT Decarbonization
Desulfurization
(industrial **waste gas** treatment using Fe-alkali solution)
- IT Tanning materials (curing)
(industrial **waste gas** treatment using Fe-alkali solution containing)
- IT **Waste gases**
(industrial; industrial **waste gas** treatment using Fe-alkali solution)
- IT Cyanation
(retro; industrial **waste gas** treatment using Fe-alkali solution)
- IT 74-90-8, Hydrogen cyanide, processes **124-38-9, Carbon dioxide**, processes 7704-34-9, Sulfur, processes
RL: **REM (Removal or disposal); PROC (Process)**
(industrial **waste gas** treatment using Fe-alkali solution)
- IT 123-31-9, 1,4-Benzenediol, uses 497-19-8, Sodium **carbonate**,
uses 584-08-7, Potassium **carbonate** 7439-89-6, Iron, uses
7601-54-9, Sodium **phosphate** 7631-89-2, Sodium arsenate
7778-53-2, Potassium **phosphate** 14312-40-4, Sodium borate
Na3BO3 21581-60-2, Potassium borate K3BO3 76080-77-8, Potassium arsenate
RL: **TEM (Technical or engineered material use); USES (Uses)**
(industrial **waste gas** treatment using Fe-alkali solution containing)

L55 ANSWER 15 OF 54 HCPLUS COPYRIGHT 2004 ACS on STN
AN 1998:394380 HCPLUS
DN 129:19142
ED Entered STN: 27 Jun 1998
TI Apparatus for treating **waste gas** containing **carbon dioxide** and sulfur dioxide
IN Yen, Chin-Ching; Lee, Chih-Ming
PA Yen, Chin-Ching, Australia; Lee, Chih-Ming
SO Pat. Specif. (Petty) (Aust.), 19 pp.

CODEN: AUXXDN

DT Patent
 LA English
 IC ICM B01D053-14
 CC 59-4 (Air Pollution and Industrial Hygiene)
 FAN.CNT 2

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	AU 685374	B3	19980115	AU 1996-74229	19961209
	US 5770167	A	19980623	US 1996-761001	19961205
PRAI	US 1996-761001	A	19961205		

AB This invention relates to a **waste gas** treating apparatus, especially for treating a **waste gas** containing sulfur dioxide and **carbon dioxide**. It includes ≥1 washing tower, in which ≥1 fluid inlet is disposed on a lateral wall of the washing tower, so that a fluid is pumped into the washing tower by constant amount and drained out from a draining opening of a base of the washing tower; ≥1 gas inlet is disposed on the wall of the washing tower below the fluid inlet. The **waste gas** is injected into the washing tower so as to contact with the fluid and form bubbles which buoy upward to a top of the washing tower and are exhausted from a gas outlet. The fluid serves to react with and absorb the pollutants contained in the **waste gas**. The products of the reaction are discharged out of the washing tower along with the fluid.

ST **waste gas** treatment app; **carbon dioxide** removal **waste gas** treatment; sulfur dioxide removal **waste gas** treatment

IT **Waste gases**
 (apparatus for treating **waste gas** containing **carbon dioxide** and sulfur dioxide)

IT Air pollution
 (control; apparatus for treating **waste gas** containing **carbon dioxide** and sulfur dioxide)

IT Lime (chemical)
 RL: NUU (Other use, unclassified); USES (Uses)
 (plasma; apparatus for treating **waste gas** containing **carbon dioxide** and sulfur dioxide)

IT 7446-09-5, Sulfur dioxide, occurrence
 RL: POL (Pollutant); OCCU (Occurrence)
 (air pollution; apparatus for treating **waste gas** containing **carbon dioxide** and sulfur dioxide)

IT 124-04-9, Adipic acid, uses
 RL: MOA (Modifier or additive use); USES (Uses)
 (apparatus for treating **waste gas** containing **carbon dioxide** and sulfur dioxide)

IT 471-34-1, Calcium carbonate, uses
 RL: NUU (Other use, unclassified); USES (Uses)
 (apparatus for treating **waste gas** containing **carbon dioxide** and sulfur dioxide)

IT 124-38-9, Carbon dioxide, processes
 7446-09-5, Sulfur dioxide, processes
 RL: POL (Pollutant); REM (Removal or disposal); OCCU (Occurrence); PROC (Process)
 (apparatus for treating **waste gas** containing **carbon dioxide** and sulfur dioxide)

IT 124-38-9, Carbon dioxide, occurrence
 RL: POL (Pollutant); OCCU (Occurrence)
 (pollution; apparatus for treating **waste gas** containing

carbon dioxide and sulfur dioxide)

L55 ANSWER 16 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
 AN 1999-045555 [04] WPIX
 DNC C1999-014385

TI Use of **carbonic** anhydrase to remove carbon di oxide from gas mixture - to produce bi **carbonate** ion solution from carbon di oxide, carbon di oxide from the solution, or to purify carbon di oxide.

DC D16 E36 J01

IN BLAIS, R; ROGERS, P A; ROGERS, P

PA (SYST-N) SYSTEMES ENVIROBIO INC; (COTW-N) CO2 SOLUTION INC

CYC 83

PI WO 9855210 A1 19981210 (199904)* EN 20p B01D053-62
 RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW NL
 OA PT SD SE SZ UG ZW
 W: AL AM AT AU AZ BA BB BG BR BY CA CH CN CU CZ DE DK EE ES FI GB GE
 GH GM GW HU ID IL IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MD MG
 MK MN MW MX NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT UA UG
 US UZ VN YU ZW

AU 9877533 A 19981221 (199919) B01D053-62
 EP 991462 A1 20000412 (200023) EN B01D053-62
 R: AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
 JP 2002508702 W 20020319 (200222) 32p B01J019-00
 US 6524843 B1 20030225 (200323) A61L009-01
 EP 991462 B1 20030423 (200329) EN B01D053-62
 R: AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
 DE 69813811 E 20030528 (200343) B01D053-62

ADT WO 9855210 A1 WO 1998-CA541 19980602; AU 9877533 A AU 1998-77533 19980602;
 EP 991462 A1 EP 1998-925349 19980602, WO 1998-CA541 19980602; JP
 2002508702 W WO 1998-CA541 19980602, JP 1999-501180 19980602; US 6524843
 B1 WO 1998-CA541 19980602, US 1999-424852 19991206; EP 991462 B1 EP
 1998-925349 19980602, WO 1998-CA541 19980602; DE 69813811 E DE 1998-613811
 19980602, EP 1998-925349 19980602, WO 1998-CA541 19980602

FDT AU 9877533 A Based on WO 9855210; EP 991462 A1 Based on WO 9855210; JP
 2002508702 W Based on WO 9855210; US 6524843 B1 Based on WO 9855210; EP
 991462 B1 Based on WO 9855210; DE 69813811 E Based on EP 991462, Based on
 WO 9855210

PRAI GB 1997-11439 19970604

IC ICM A61L009-01; B01D053-62; B01J019-00
 ICS B01D047-00; B01D053-84; B01J008-04; C01B031-20; C12M001-40

AB WO 9855210 A UPAB: 19990224

Carbonic anhydrase or an analog thereof immobilised in a bioreactor is used for: (A) **removing carbon dioxide** from a **CO2**-containing **gas**; (B) producing enriched solutions of hydrogen and **bicarbonate** ions from a **CO2**-containing **gas**; or (C) producing **CO2** from enriched solutions of hydrogen and **bicarbonate** ions.

Also claimed is apparatus comprising a bioreactor for processes (A)+(B) (which are effectively the same process), optionally with a second bioreactor for process (C), and/or a further reactor comprising an ion exchanger for a process (D), in which **bicarbonate** ions the enriched solution from step (A/B) are exchanged with hydroxyl ions from the ion exchanger, and then combine with hydrogen ions to form **water**.

USE - **Carbonic** anhydrase is used to effect the reversible **hydration** of **CO2** for **removal** of **CO2** from **gases**, for the purification of **CO2**, and/or for production

of hydrogen ions and **bicarbonate** ions. Useful in spacecraft applications.

Dwg.1/2

FS CPI
 FA AB; GI; DCN
 MC CPI: D05-A01B4; E11-Q01; E11-Q02; E31-A02; E31-N05C; J01-E02

L55 ANSWER 17 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
 AN 1998-348293 [30] WPIX
 DNC C1998-107659
 TI Continuous removal of carbon di oxide from process gas - where the process solution is regenerated by removing organic acid potassium salts while retaining potassium vanadate and other constituents.
 DC E36 J01 M14
 IN HESSE, H J F; DU TOIT, F J; HESSE, H J F A; SMIT, M J; HESS, H J F A
 PA (SASO-N) SASOL CHEM EURO LTD; (SASO-N) SASOL TECHNOLOGY PTY LTD
 CYC 84
 PI WO 9825688 A1 19980618 (199830)* EN 21p B01D053-62 <--
 RW: AT BE CH DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW NL OA
 PT SD SE SZ UG ZW
 W: AL AM AT AU AZ BA BB BG BR BY CA CH CN CU CZ DE DK EE ES FI GB GE
 GH GM GW HU ID IL IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MD MG
 MK MN MW MX NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT UA UG
 US UZ VN YU ZW
 ZA 9710745 A 19980826 (199840) 20p B01D000-00
 AU 9878454 A 19980703 (199847) B01D053-62 <--
 NO 9902856 A 19990811 (199943) B01D000-00
 EP 948390 A1 19991013 (199947) EN B01D053-62 <--
 R: AL AT BE CH DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT RO
 SE SI
 AU 716350 B 20000224 (200020) B01D053-62 <--
 BR 9713928 A 20000321 (200028) B01D053-62 <--
 EP 948390 B1 20010314 (200116) EN B01D053-62 <--
 R: AL AT BE CH DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT RO
 SE SI
 MX 9904916 A1 20000401 (200124) B01D053-62 <--
 DE 69704284 E 20010419 (200129) B01D053-62 <--
 KR 2000069372 A 20001125 (200130) B01D053-62 <--
 ES 2156638 T3 20010701 (200141) B01D053-62 <--
 US 6312655 B1 20011106 (200170) B01D053-62 <--
 MX 204306 B 20010917 (200239) B01D053-14 <--
 PH 1199758797 B1 20020822 (200413) B01D053-62 <--
 ADT WO 9825688 A1 WO 1997-GB3431 19971212; ZA 9710745 A ZA 1997-10745
 19971128; AU 9878454 A AU 1998-78454 19971212; NO 9902856 A WO 1997-GB3431
 19971212, NO 1999-2856 19990611; EP 948390 A1 EP 1997-949044 19971212, WO
 1997-GB3431 19971212; AU 716350 B AU 1998-78454 19971212; BR 9713928 A BR
 1997-13928 19971212, WO 1997-GB3431 19971212; EP 948390 B1 EP 1997-949044
 19971212, WO 1997-GB3431 19971212; MX 9904916 A1 MX 1999-4916 19990527; DE
 69704284 E DE 1997-604284 19971212, EP 1997-949044 19971212, WO
 1997-GB3431 19971212; KR 2000069372 A WO 1997-GB3431 19971212, KR
 1999-705096 19990608; ES 2156638 T3 EP 1997-949044 19971212; US 6312655 B1
 WO 1997-GB3431 19971212, US 1999-297891 19990713; MX 204306 B MX 1999-4916
 19990527; PH 1199758797 B1 PH 1997-58797 19971212
 FDT AU 9878454 A Based on WO 9825688; EP 948390 A1 Based on WO 9825688; AU
 716350 B Previous Publ. AU 9878454, Based on WO 9825688; BR 9713928 A
 Based on WO 9825688; EP 948390 B1 Based on WO 9825688; DE 69704284 E Based
 on EP 948390, Based on WO 9825688; KR 2000069372 A Based on WO 9825688; ES
 2156638 T3 Based on EP 948390; US 6312655 B1 Based on WO 9825688

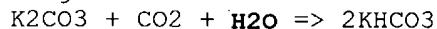
PRAI ZA 1996-10473 19961212

IC ICM B01D000-00; **B01D053-14; B01D053-62**

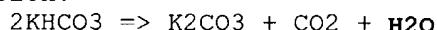
ICS **B01D053-96;** C02F000-00; C10K000-00; C23F011-06

AB WO 9825688 A UPAB: 19991122

Continuous removal of carbon dioxide from process gas by contacting the process gas under pressure in an absorption stage with an aqueous solution having dissolved therein potassium carbonate reagent, potassium bicarbonate reaction product, diethanol amine catalyst and potassium vanadate corrosion inhibitor, the carbon dioxide being absorbed by the solution and reacting therein with the potassium carbonate according to the reaction:



followed by an increase in the solution temperature and a decrease in the pressure exerted thereon to cause desorption, in a separate desorption stage, of the carbon dioxide from the solution according to the reverse reaction:



The aqueous solution is continuously recycled from the desorption stage to the absorption stage for further removal of carbon dioxide from process gas, the aqueous solution containing organic acids dissolved therein in the form of potassium salts.

The removal of carbon dioxide from the process gas is associated with a continuous increase in the organic acid concentration in solution.

The method comprises withdrawing as a side stream part of the aqueous solution, diluting the side stream with an aqueous diluent, and passing the side stream over a semipermeable membrane across which there is a pressure drop, to cause an aqueous solution of organic acid potassium salts to pass through the membrane, the remainder of the side stream being returned to the circuit.

The membrane and pressure drop are selected such that vanadate anions are essentially prevented from passing through the membrane and acceptably small proportions of potassium carbonate, potassium bicarbonate and diethanolamine pass through the membrane, the potassium carbonate and diethanolamine being added to the circuit as required to maintain their concentration in the aqueous solution.

Also claimed is treatment of an aqueous solution having dissolved therein potassium carbonate, potassium bicarbonate, diethanolamine, potassium vanadate and organic acid potassium salts, to remove the organic salts while retaining the potassium vanadate in the solution.

USE - The process is particularly useful in treatment of Benfield solutions or other process solutions containing potassium carbonate, potassium bicarbonate, diethanol amine and potassium vanadate and, as impurities, organic acid potassium salts, of the type used for removing carbon dioxide from process gas streams.

ADVANTAGE - The process avoids the discharge to waste of spent benfield solution by allowing its regeneration by removal of acid salts while substantially all the poisonous vanadate ions are retained in solution together with most of the potassium carbonate, potassium bicarbonate and diethanol amine. The pressure already existing in the carbon dioxide scrubbing units of the absorption stage can be used indirectly to provide a pressure drop across the semi-permeable membrane.

Dwg. 0/1

FS CPI
 FA AB; DCN
 MC CPI: E11-Q02; E31-N05C; J01-C03; J01-E02A; M14-K

L55 ANSWER 18 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
 AN 1998:301873 HCAPLUS
 DN 128:298686
 ED Entered STN: 23 May 1998
 TI Absorption of carbon dioxide by lime **water** spray
 AU Taniguchi, Izumi; Yokoyama, Hiroki; Asano, Koichi
 CS Dep. Chem. Eng., Fac. Eng., Tokyo Inst. Technol., Tokyo, 152-8552, Japan
 SO Sekiyu Gakkaishi (1998), 41(3), 227-231
 CODEN: SKGSAE; ISSN: 0582-4664
 PB Sekiyu Gakkai
 DT Journal
 LA Japanese
 CC 59-4 (**Air Pollution** and Industrial Hygiene)
 AB Exptl. studies of **gas** absorption were carried out for
carbon dioxide-air-aqueous $\text{Ca}(\text{OH})_2$ solution system
 using a small spray column over a wide range of mass flow rates of liquid L
 $= 3-8 + 10^{-3}$ kg/s, mass flow rates of carbon dioxide-air mixts. G =
 $0.5-2.0 + 10^{-3}$ kg/s, and feed gas concns. y = 0.1-1.0. Observed data
 for the dimensionless rate of absorption of carbon dioxide showed good
 agreement with the one predicted by a solid sphere penetration model with
 second order irreversible chemical reaction for feed gas concentration $y \leq$
 0.2. The systematic deviation from the predicted one became considerable
 with increasing feed gas concentration and Fourier number. This may be due to
 the formation of calcium **carbonate** precipitate near the gas-liquid interface
 of the spray drops.
 ST carbon dioxide wet scrubbing lime; absorption carbon dioxide calcium
 hydroxide soln
 IT **Waste gases**
 Wet scrubbing
 (absorption of **carbon dioxide** by lime **water**
 spray)
 IT 1305-62-0, Calcium hydroxide, reactions
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (absorption of carbon dioxide by lime **water** spray)
 IT 124-38-9, **Carbon dioxide**, processes
 RL: REM (Removal or disposal); PROC (Process)
 (absorption of **carbon dioxide** by lime **water**
 spray)

L55 ANSWER 19 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
 AN 1997-187312 [17] WPIX
 DNC C1997-059773
 TI Recovering carbon di oxide gas from **waste** acid treatment bath -
 by neutralising acid(s) to **carbonate**(s), condensing gas by amine
 absorption or PSA and liquidising.
 DC E36 J01 M14
 PA (YAWA) NIPPON STEEL CORP
 CYC 1
 PI JP 09047634 A 19970218 (199717)* 3p B01D053-62 <--
 ADT JP 09047634 A JP 1995-219529 19950804
 PRAI JP 1995-219529 19950804
 IC ICM **B01D053-62**

ICS B01D053-04; C01B013-02; C01B031-20

AB JP 09047634 A UPAB: 19970424

Water and acid mist in the gas (A) generated from a **waste** acid bath (B) are **removed**, then **CO₂** in the **gas** is condensed by treating by amine absorption or PSA, and liquidised. **Waste** acids are neutralised by adding them to **carbonates**. Alternatively (A) is drawn by blower from (B), then the concentration of CO₂ in (A) is increased by injecting it into (B), then recovering again.

USE - Used for recovering **CO₂ gas** generated from **waste** acid treatment baths.

ADVANTAGE - Recovery of CO₂ which has been discharged into the environment is enabled.

Dwg.0/1

FS CPI

FA AB; DCN

MC CPI: E11-Q01; E31-N05C; J01-E03D; M14-A

L55 ANSWER 20 OF 54 JICST-EPlus COPYRIGHT 2004 JST on STN
AN 970592835 JICST-EPlusTI Fixation of **carbon dioxide** by model complex
of **carbonic** anhydrase active site.

AU NAKATA KO; ICHIKAWA KAZUHIKO

CS Hokkaido Univ., Grad. Sch.

SO Nippon Kagakkai Koen Yokoshu, (1997) vol. 72nd, no. 2, pp. 602. Journal
Code: S0493A

ISSN: 0285-7626

CY Japan

LA Japanese

STA New

AB It is suggested that in **carbonic** anhydrase CO₂ undergoes nucleophilic attack of hydroxide ion bound to zinc(II) and is **hydrated**. In this work the model complex, $\text{ZnL(OH}_2\text{)}_2^+$ (L=tris(2-benzimidazolylmethyl)amine), was deprotonated by base and reacted with **CO₂ gas**. The IR spectrum indicated the production of coordinated **carbonate** ion. (author abst.)

L55 ANSWER 21 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1996:273667 HCAPLUS

DN 124:324242

ED Entered STN: 11 May 1996

TI **Carbon dioxide** recovery from **waste**
gases at low cost and the **carbon dioxide**
adsorbents used

IN Hayashi, Hiroshi; Hirano, Shinichi; Shigemoto, Naoya; Yamada, Shinichi

PA Shikoku Sogo Kenkyusho KK, Japan

SO Jpn. Kokai Tokkyo Koho, 9 pp.

CODEN: JKXXAF

DT Patent

LA Japanese

IC ICM C01B031-20

ICS B01D053-04; B01D053-34; B01D053-81; B01D053-62; B01J020-04

CC 59-4 (**Air Pollution** and Industrial Hygiene)

FAN.CNT 1

PATENT NO. KIND DATE APPLICATION NO. DATE

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PI JP 08040715 A2 19960213 JP 1995-114184 19950512

PRAI JP 1994-108218 19940523

AB A **gas** containing steam and CO₂ is introduced into a CO₂ adsorbing agent, which is a dried porous material, e.g. activated C, zeolite, alumina, kieselguhr, or their mixture, carrying 2K₂CO₃·3H₂O and/or Na₂CO₃.cntdot.**H₂O** in the voids, to recover CO₂ efficiently at low cost from the **gas**. The CO₂ recovering method may further involve a process either to decrease the pressure of the CO₂ adsorbing agent or to introduce steam into the agent in order to release CO₂ captured as KHCO₃ and/or NaHCO₃ in the voids after the gas introduction and a process to cool the agent to liquefy steam and recover highly pure CO₂. The adsorbing agent may be prepared by immersing the dried porous material in an **aqueous** solution containing Na₂CO₃ and/or K₂CO₃ and evaporating the **aqueous** solution to carry 2K₂CO₃·3H₂O and/or Na₂CO₃-**H₂O** in the voids.

ST **carbon dioxide removal waste gas;**
adsorbent **waste gas** treatment

IT Adsorbents
Steam
 Waste gases
 (adsorbents preparation for **carbon dioxide** removal from
 waste gas)

IT Kieselguhr
Zeolites, uses
RL: NUU (Other use, unclassified); USES (Uses)
 (adsorbents preparation for **carbon dioxide** removal from
 waste gas)

IT 7440-44-0, Activated carbon, uses
RL: NUU (Other use, unclassified); USES (Uses)
 (activated; adsorbents preparation for **carbon dioxide**
 removal from **waste gas**)

IT 144-55-8P, Sodium hydrogencarbonate, reactions 298-14-6P
RL: BYP (Byproduct); RCT (Reactant); PREP (Preparation); RACT (Reactant or
reagent)
 (adsorbents preparation for **carbon dioxide** removal from
 waste gas)

IT 1344-28-1, Alumina, uses
RL: NUU (Other use, unclassified); USES (Uses)
 (adsorbents preparation for **carbon dioxide** removal from
 waste gas)

IT 124-38-9, **Carbon dioxide**, processes
RL: POL (Pollutant); REM (Removal or disposal); OCCU
(Occurrence); PROC (Process)
 (adsorbents preparation for **carbon dioxide** removal from
 waste gas)

IT 497-19-8, Sodium **carbonate**, reactions 584-08-7, Potassium
carbonate
RL: RCT (Reactant); RACT (Reactant or reagent)
 (adsorbents preparation for **carbon dioxide** removal from
 waste gas)

L55 ANSWER 22 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 1996:261820 HCAPLUS
DN 124:297850
ED Entered STN: 03 May 1996
TI Permanent storage of carbon dioxide in the marine environment: The solid
CO₂ penetrator
AU Murray, C. N.; Visintini, L.; Bidoglio, G.; Henry, B.
CS Institute Remote Sensing Applications, Ispra, 21020, Italy
SO Energy Conversion and Management (1996), 37(6-8), 1067-72

CODEN: ECMADL; ISSN: 0196-8904

PB Elsevier

DT Journal

LA English

CC 60-5 (Waste Treatment and Disposal)

Section cross-reference(s): 59

AB To circumvent the uncertainty related to presently studied ocean disposal options based on pumping of liquid CO₂ or **hydrate** slurry injection at depth, with the associated risk of short term phys. and biol. oceanog. processes returning an important fraction of it to the atmospheric, a disposal technique using the natural geochem. storage properties of deep marine (**carbonate** or alumino-silicate rich) sedimentary formations is suggested. The technique proposed would depend on the fact that CO₂ can be obtained as a solid by cooling to -78.5°. The overall d. is approx. one and a half times, .apprx.1.56 kg/dm³, that of seawater. If the solid was shaped as a torpedo and then left to fall through the **water** column it would penetrate quite deeply into soft underlying sediments. This conclusion is based on in-situ investigations using penetrators that were studied as a disposal option for other solid wastes. This concept should, therefore, provide permanent storage as the emplaced CO₂ will be chemical **sequestered** by the sediments (via the formation of an intermediate clathrate). Other than secure segregation of the emplaced CO₂, the penetrator option has a further major advantage in that there should be no long-term effects to biol. systems: penetrator disposal is deep within sedimentary formations which have zero or very low biol. activity.

ST carbon dioxide marine disposal solid penetrator

IT Flue **gases****Waste gases**

Waste solids

(permanent storage of **carbon dioxide** in marine environment using solid CO₂ penetrator)

IT 124-38-9, Carbon dioxide, processes

RL: REM (Removal or disposal); PROC (Process)

(permanent storage of **carbon dioxide** in marine environment using solid CO₂ penetrator)

L55 ANSWER 23 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1996:11293 HCAPLUS

DN 124:36492

ED Entered STN: 05 Jan 1996

TI Solidification of magnesium **carbonate** by autoclave reaction

IN Shibasaki, Yasuo; Inukai, Keiichi; Kigami, Makoto; Ishida, Hideki; Goto, Yasuo; Nagata, Tatsuya; Yamamoto, Takayuki; Maenami, Hiroki

PA Kogyo Gijutsuin, Japan; Inax Corp

SO Jpn. Kokai Tokkyo Koho, 9 pp.

CODEN: JKXXAF

DT Patent

LA Japanese

IC ICM C04B040-02

ICS B09B003-00; C04B009-00; C04B022-06; C04B028-00

ICI C04B028-00, C04B028-30, C04B022-06; C04B111-00

CC 59-4 (**Air** Pollution and Industrial Hygiene)

Section cross-reference(s): 58

FAN.CNT 1

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
-----	-----	-----	-----	-----
PI JP 07267758	A2	19951017	JP 1994-62357	19940331

JP 3341009 B2 20021105
PRAI JP 1994-62357 19940331

- AB The process comprises solidifying MgCO₃ or MgCO₃-based materials by autoclave reaction, optionally (1) mixing the materials with (a) siliceous materials, (b) substances increasing solubility of MgCO₃, or (c) siliceous materials and substances increasing solubility of MgCO₃ and/or siliceous materials before the autoclave reaction, (2) using solns. of substances increasing solubility of MgCO₃ as autoclave treatment solns., or (3) mixing the materials with siliceous materials before the autoclave reaction and using solns. of substances increasing solubility of MgCO₃ and/or siliceous materials as autoclave treatment solns. The solidified materials of MgCO₃ or (Ca,Mg)CO₃, which is fixed from CO₂ in combustion **waste gases**, are utilized in building and construction materials.
- ST magnesium **carbonate** solidification autoclave reaction; siliceous material magnesium **carbonate** solidification; solv improver magnesium **carbonate** solidification; **waste gas** carbon dioxide fixation; recycling magnesium **carbonate** building material
- IT **Waste gases**
(fixed carbon dioxide from; solidification of magnesium **carbonate** by autoclave reaction)
- IT Silt
Slags
(magnesium **carbonate** solidification with; solidification of magnesium **carbonate** by autoclave reaction)
- IT Clays, reactions
Kieselguhr
RL: MOA (Modifier or additive use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
(magnesium **carbonate** solidification with; solidification of magnesium **carbonate** by autoclave reaction)
- IT Ashes (residues)
(of sludges, magnesium **carbonate** solidification with; solidification of magnesium **carbonate** by autoclave reaction)
- IT Tiles
(scraps, magnesium **carbonate** solidification with; solidification of magnesium **carbonate** by autoclave reaction)
- IT Glass, oxide
RL: MOA (Modifier or additive use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
(scraps, magnesium **carbonate** solidification with; solidification of magnesium **carbonate** by autoclave reaction)
- IT Sand
RL: MOA (Modifier or additive use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
(siliceous, magnesium **carbonate** solidification with; solidification of magnesium **carbonate** by autoclave reaction)
- IT Glazes
(sludges from, magnesium **carbonate** solidification with; solidification of magnesium **carbonate** by autoclave reaction)
- IT Autoclaves
(solidification of magnesium **carbonate** by autoclave reaction)
- IT Siliceous materials
RL: MOA (Modifier or additive use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
(solidification of magnesium **carbonate** by autoclave reaction)
- IT Building materials
Recycling

(solidified magnesium **carbonate** for; solidification of magnesium **carbonate** by autoclave reaction)

IT Cement
Concrete
(**waste, magnesium carbonate**
solidification with; solidification of magnesium **carbonate** by autoclave reaction)

IT Ashes (residues)
(coal, magnesium **carbonate** solidification with;
solidification of magnesium **carbonate** by autoclave reaction)

IT **Wastes**
(industrial, **magnesium carbonate** solidification
with; solidification of magnesium **carbonate** by autoclave reaction)

IT **Waste** solids
(sludges, solidification of **magnesium carbonate** by
autoclave reaction)

IT 14808-60-7, Quartz (SiO₂), reactions
RL: MOA (Modifier or additive use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
(Cristalite VX-X; solidification of magnesium **carbonate** by autoclave reaction)

IT 60676-86-0, Silica, vitreous
RL: MOA (Modifier or additive use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
(Fuselex FF; solidification of magnesium **carbonate** by autoclave reaction)

IT 7631-86-9, Silica, reactions
RL: MOA (Modifier or additive use); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
(magnesium **carbonate** solidification with; solidification of magnesium **carbonate** by autoclave reaction)

IT 546-93-0, Magnesium **carbonate** 12125-28-9, Basic
magnesium **carbonate**
RL: PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(solidification of magnesium **carbonate** by autoclave reaction)

IT 144-55-8, Sodium **carbonate** (NaHCO₃), uses 298-14-6, Potassium **carbonate** (KHC₃O) 497-19-8, Sodium **carbonate** (Na₂CO₃), uses 506-87-6, Ammonium **carbonate** ((NH₄)₂CO₃) 554-13-2, Lithium **carbonate** (Li₂CO₃) 584-08-7, Potassium **carbonate** (K₂CO₃) 1066-33-7 1310-58-3, Potassium hydroxide, uses 1310-65-2, Lithium hydroxide 1310-73-2, Sodium hydroxide, uses 5006-97-3, Lithium **carbonate** (LiHCO₃) 6484-52-2, Ammonium nitrate, uses 7447-40-7, Potassium chloride, uses 7447-41-8, Lithium chloride, uses 7550-35-8, Lithium bromide 7631-99-4, Sodium nitrate, uses 7647-14-5, Sodium chloride, uses 7647-15-6, Sodium bromide, uses 7757-79-1, Potassium nitrate, uses 7758-02-3, Potassium bromide, uses 7790-69-4, Lithium nitrate 10124-37-5, Calcium nitrate 12124-97-9, Ammonium bromide 12125-02-9, Ammonium chloride, uses
RL: MOA (Modifier or additive use); USES (Uses)
(solubility improvers; solidification of magnesium **carbonate** by autoclave reaction)

IT 124-38-9, Carbon dioxide, processes
RL: REM (Removal or disposal); PROC (Process)
(**waste gases containing, magnesium carbonate** fixed from; solidification of magnesium **carbonate** by autoclave reaction)

L55 ANSWER 24 OF 54 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1996:13390 HCPLUS
 DN 124:96118
 ED Entered STN: 06 Jan 1996
 TI **Fixation** of carbon dioxide by using industrial wastes
 IN Shibasaki, Yasuo; Inukai, Keiichi; Kigami, Makoto; Ishida, Hideki; Goto, Yasuo; Nagata, Tatsuya; Yamamoto, Takayuki; Maenami, Hiroki
 PA Kogyo Gijutsuin, Japan; Inax Corp
 SO Jpn. Kokai Tokkyo Koho, 3 pp.
 CODEN: JKXXAF
 DT Patent
 LA Japanese
 IC ICM B01J019-00
 ICS C01B031-20; C01B031-24; C01F005-24; C01F011-18
 CC 59-4 (**Air Pollution** and Industrial Hygiene)
 Section cross-reference(s): 60
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 07265688	A2	19951017	JP 1994-62360	19940331
PRAI	JP 1994-62360		19940331		

AB The process comprises contacting industrial wastes containing CaO and/or MgO with **H₂O** to dissolve Ca²⁺ and/or Mg²⁺ in **H₂O** and contacting the resulting **water** with **CO₂ gas** to form CaCO₃ and/or MgCO₃. **CO₂** discharged from industrial **waste gases** is efficiently **fixed** by the low-cost process.

ST carbon dioxide **fixation** industrial waste; calcium **carbonate** formation carbon dioxide; magnesium **carbonate** formation carbon dioxide

IT Flue **gases**

Waste gases
 (carbon dioxide from; **fixation** of carbon dioxide by using industrial wastes)

IT Slags

(**fixation** of carbon dioxide by using industrial wastes)

IT Waste solids

(industrial, **fixation** of carbon dioxide by using industrial wastes)

IT 471-34-1P, Calcium **carbonate**, preparation
 546-93-0P

RL: PNU (Preparation, unclassified); PREP (Preparation)
 (carbon dioxide **fixed** as; **fixation** of carbon dioxide by using industrial wastes)

IT 124-38-9, **Carbon dioxide**, processes

RL: PEP (Physical, engineering or chemical process); REM (**Removal or disposal**); PROC (Process)
 (**fixation** of carbon dioxide by using industrial wastes)

IT 1305-78-8, Calcium oxide, reactions 1309-48-4, Magnesium oxide, reactions

RL: RCT (Reactant); RACT (Reactant or reagent)
 (industrial waste components; **fixation** of carbon dioxide by using industrial wastes)

L55 ANSWER 25 OF 54 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1995:571392 HCPLUS

DN 123:151252
 ED Entered STN: 25 May 1995
 TI Hydrothermal crystallization of calcium **carbonate**
 IN Kigami, Makoto; Ishida, Hideki; Nagata, Tatsuya
 PA Inax Corp, Japan
 SO Jpn. Kokai Tokkyo Koho, 5 pp.
 CODEN: JKXXAF
 DT Patent
 LA Japanese
 IC ICM C04B007-13
 ICS C04B007-00; C04B007-34; C04B040-02
 CC 58-6 (Cement, Concrete, and Related Building Materials)
 Section cross-reference(s): 59

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 07061842	A2	19950307	JP 1993-209399	19930824
	JP 3240766	B2	20011225		
PRAI	JP 1993-209399		19930824		

AB The process comprises autoclaving CaCO₃ (I) or I-based materials, optionally mixed with siliceous materials. The solid products are suitable for use as building materials. The process is useful for hydrothermally crystg. 7 I obtained from CO₂ removal from **waste gases**.

ST calcium **carbonate** silica hydrothermal crystn; **waste gas carbon dioxide calcium carbonate**

IT Building materials

Waste gases

(hydrothermal crystallization of **calcium carbonate** from CO₂ removal from **waste gases**, optionally with silica, for building materials)

IT Crystallization

(hydrothermal, hydrothermal crystallization of **calcium carbonate** from CO₂ removal from **waste gases**, optionally with silica, for building materials)

IT 14808-60-7, Quartz (SiO₂), processes 60676-86-0

RL: PEP (Physical, engineering or chemical process); PROC (Process)
 (hydrothermal crystallization of **calcium carbonate** from CO₂ removal from **waste gases**, optionally with silica, for building materials)

IT 124-38-9, Carbon dioxide, processes

RL: REM (Removal or disposal); PROC (Process)
 (hydrothermal crystallization of **calcium carbonate** from CO₂ removal from **waste gases**, optionally with silica, for building materials)

IT 471-34-1, Calcium **carbonate**, processes

RL: FMU (Formation, unclassified); PEP (Physical, engineering or chemical process); FORM (Formation, nonpreparative); PROC (Process)
 (hydrothermal crystallization of **calcium carbonate** from CO₂ removal from **waste gases**, optionally with silica, for building materials, Hakuenga PZ)

L55 ANSWER 26 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1995:283667 HCAPLUS

DN 122:37761

ED Entered STN: 10 Jan 1995

TI Salt **Hydrates**: New Reversible Absorbents for Carbon Dioxide

AU Quinn, R.; Appleby, J. B.; Pez, G. P.
CS Corporate Science and Technology Center, Air Products and Chemicals Inc.,
Allentown, PA, 18195-1501, USA
SO Journal of the American Chemical Society (1995), 117(1), 329-35
CODEN: JACSAT; ISSN: 0002-7863
PB American Chemical Society
DT Journal
LA English
CC 59-4 (Air Pollution and Industrial Hygiene)
AB Melts of salt **hydrates** such as tetramethylammonium fluoride tetrahydrate, [(CH₃)₄N]F·4H₂O, and tetraethylammonium acetate tetrahydrate, [(C₂H₅)₄N]CH₃CO₂·4H₂O, have been found to exhibit unexpectedly large CO₂ absorption capacities. For example, [(CH₃)₄N]F·4H₂O at 50° and 100 kPa CO₂ absorbs 0.28 mol of **gas**/mol of salt corresponding to a CO₂ concentration of .apprx.1.9M. Absorption is fully reversible and **gas** is desorbed by reducing the CO₂ pressure above the melt. A survey of salt **hydrates** revealed that those which contain relatively basic anions, such as malonate or citrate, likewise exhibit relatively large CO₂ absorption capacities while those which contain relatively neutral anions, such as chloride, do not. The CO₂ absorption capacity of salt **hydrates** is dependent on the **water** content of the salt and decreases with increasing **water** content. Characterization by NMR and FTIR of [(CH₃)₄N]F·4H₂O containing absorbed CO₂ is consistent with the presence of **bicarbonate** and bifluoride ions in the melt. Exposure of [(CH₃)₄N]F containing H₂18O to CO₂ resulted in incorporation of the label into the gas phase as C₁8O₁6O and C₁8O₂, implying that CO₂ reacts reversibly with the melt via a **hydration** reaction. Spectroscopic evidence suggests that carboxylate-containing salt **hydrates** also bind CO₂ as **bicarbonate** but the nature of the protonated anion species remains undetd. However, modeling of isotherm data suggests a one-to-one salt **hydrate**-to-CO₂ reaction stoichiometry. In contrast, modeling of fluoride-containing salt **hydrate** isotherms supports a two-to-one salt **hydrate**-to-CO₂ reaction stoichiometry, which is consistent with spectroscopic and reactivity studies of the underlying chemical. The heats of absorption of CO₂ by [(CH₃)₄N]F·4H₂O and [(C₂H₅)₄N]CH₃CO₂·4H₂O are relatively low, -4.5 and -8.4 kcal/mol, resp., suggesting that these may be attractive, more energy efficient, alternatives to com. amine based absorbents for the removal of CO₂.
ST salt **hydrate** carbon dioxide absorbent
IT **Hydrates**
RL: NUU (Other use, unclassified); USES (Uses)
(absorbent; carbon dioxide removal from air by absorption with)
IT Air pollution
 Waste gases
 (carbon dioxide removal by absorption with salt
 hydrates)
IT 17787-40-5, Tetramethylammonium fluoride tetrahydrate 67533-12-4,
Tetraethylammonium acetate tetrahydrate
RL: NUU (Other use, unclassified); USES (Uses)
(absorbent; carbon dioxide removal from air by absorption with)
IT 124-38-9P, **Carbon dioxide**, processes
RL: POL (Pollutant); PUR (Purification or recovery); REM (**Removal or disposal**); OCCU (Occurrence); PREP (Preparation); PROC (Process)
(removal from air by absorption with salt **hydrates**)

AN 1994:540664 HCAPLUS
 DN 121:140664
 ED Entered STN: 17 Sep 1994
 TI Method for reducing atmospheric pollution by carbon dioxide and sulfur dioxide
 IN Eyal, Meir Aharon
 PA Godwin, Edgar James, UK; Hamit Energy AS
 SO PCT Int. Appl., 27 pp.
 CODEN: PIXXD2
 DT Patent
 LA English
 IC ICM B01D053-34
 CC 59-4 (**Air Pollution** and Industrial Hygiene)
 Section cross-reference(s): 51

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 9412266	A1	19940609	WO 1993-GB2406	19931123
	W: AT, AU, BB, BG, BR, BY, CA, CH, CZ, DE, DK, ES, FI, GB, HU, JP, KP, KR, KZ, LK, LU, LV, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SK, UA, US, UZ, VN				
	RW: AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG				
	IL 103918	A1	19961016	IL 1992-103918	19921129
	CA 2150363	AA	19940609	CA 1993-2150363	19931123
	CA 2150363	C	20010508		
	AU 9455318	A1	19940622	AU 1994-55318	19931123
	EP 670750	A1	19950913	EP 1994-900249	19931123
	EP 670750	B1	19970528		
	R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LI, NL, PT, SE				
	JP 08503884	T2	19960430	JP 1993-512899	19931123
	AT 153557	E	19970615	AT 1994-900249	19931123
	ES 2104328	T3	19971001	ES 1994-900249	19931123
	PL 175655	B1	19990129	PL 1993-309221	19931123
	CZ 290653	B6	20020911	CZ 1995-1355	19931123
	FI 9502572	A	19950717	FI 1995-2572	19950526
	NO 9502093	A	19950726	NO 1995-2093	19950526
	US 5958353	A	19990928	US 1995-436392	19950727
PRAI	IL 1992-103918	A	19921129		
	WO 1993-GB2406	W	19931123		

AB For reducing atmospheric pollution caused by **CO₂** and **SO₂** in industrial **gases** being emitted to the atmospheric, through the conversion of **CO₂** to calcium **carbonate** and the conversion of **SO₂** to calcium sulfite using conventionally available calcium salt-containing reactant, the method comprises reacting the gas prior to venting with an alkali base and an **aqueous** liquor, whereby the pollutant reacts with the base and transfers to the liquor, and the resulting gas vented to the atmospheric has a reduced pollutant content; and reacting the pollutant-loaded liquor with a calcium salt-containing reactant to form calcium **carbonate** and calcium sulfite, with co-formation of a com. utilizable salt containing an anion from the calcium salt reactant and a cation from the alkali base.

ST **carbon dioxide** removal industrial **gas**;
 sulfur dioxide removal industrial **gas**; **waste gas**
carbon dioxide sulfur dioxide

IT Phosphate rock and Phosphorite
 RL: USES (Uses)
 (in **carbon dioxide**/sulfur dioxide removal from industrial **waste gases**)

IT **Waste gases**
 (industrial, **carbon dioxide**/sulfur dioxide removal
 from)

IT 10257-55-3, Calcium sulfite
 RL: OCCU (Occurrence)
 (**carbon dioxide** removal from industrial
 waste gases as)

IT **471-34-1**, Calcium **carbonate**, miscellaneous
 RL: MSC (Miscellaneous)
 (**carbon dioxide** removal from industrial
 waste gases as)

IT 506-87-6, Ammonium **carbonate** 1310-58-3, Potassium hydroxide,
 uses 1310-73-2, Sodium hydroxide, uses 7664-38-2, Phosphoric acid,
 uses 7664-41-7, Ammonia, uses 7697-37-2, Nitric acid, uses
 7758-87-4, Calcium phosphate 7783-20-2, Ammonium sulfate, uses
 10043-52-4, Calcium chloride, uses 10124-37-5, Calcium nitrate
 13397-24-5, Gypsum, uses
 RL: OCCU (Occurrence)
 (in **carbon dioxide**/sulfur dioxide removal from
 industrial **waste gases**)

IT **124-38-9**, Carbon **dioxide**, miscellaneous
 RL: REM (Removal or disposal); PROC (Process)
 (removal of, from industrial **waste gases**, as
 calcium carbonate)

IT 7446-09-5, Sulfur dioxide, miscellaneous
 RL: REM (Removal or disposal); PROC (Process)
 (removal of, from industrial **waste gases**, as
 calcium sulfite)

L55 ANSWER 28 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
 AN 1994:662514 HCAPLUS
 DN 121:262514
 ED Entered STN: 26 Nov 1994
 TI Plants for recovery of carbon dioxide
 IN Harashina, Heihachi
 PA Ishikawajima Harima Heavy Ind, Japan
 SO Jpn. Kokai Tokkyo Koho, 5 pp.
 CODEN: JKXXAF

DT Patent
 LA Japanese
 IC ICM C01F011-18
 ICS B01D053-34; C01B031-20
 CC 59-4 (**Air Pollution** and Industrial Hygiene)
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 06211518	A2	19940802	JP 1993-5426	19930114
	JP 3395228	B2	20030407		
PRAI	JP 1993-5426		19930114		

AB The plants, for formation of CaCO₃ by the reaction of CO₂
 gas with Ca(OH)₂, are equipped with the means for controlling the
 amount of injection of H₂O at saturated amount corresponding to the amount
 of Ca(OH)₂ added, precipitation-separation tanks for precipitation of CaCO₃
 from mixts. containing
 CO₂, Ca(OH)₂, and H₂O and solubilization of the unreacted
 Ca(OH)₂ in H₂O, and the means, connected with the precipitation-separation
 tanks, for recovery and recirculation of the Ca(OH)₂.

ST carbon dioxide removal calcium hydroxide; calcium **carbonate**

formation decarbonization

IT **Waste gases**
 (removal of **carbon dioxide** by calcium
carbonate formation with calcium hydroxide and recovery of
 unreacted calcium hydroxide)

IT **471-34-1, Calcium carbonate, processes**
 RL: FMU (Formation, unclassified); PEP (Physical, engineering or chemical process); **REM (Removal or disposal)**; FORM (Formation, nonpreparative); PROC (Process)
 (immobilization of **carbon dioxide** by calcium
carbonate formation with calcium hydroxide and recovery of
 unreacted calcium hydroxide)

IT 1305-62-0, Calcium hydroxide, reactions
 RL: PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
 (immobilization of carbon dioxide by calcium **carbonate**
 formation with calcium hydroxide and recovery of unreacted calcium hydroxide)

IT **124-38-9, Carbon dioxide, reactions**
 RL: RCT (Reactant); **REM (Removal or disposal)**; PROC (Process);
 RACT (Reactant or reagent)
 (immobilization of **carbon dioxide** by calcium
carbonate formation with calcium hydroxide and recovery of
 unreacted calcium hydroxide)

L55 ANSWER 29 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1994:685808 HCAPLUS

DN 121:285808

ED Entered STN: 10 Dec 1994

TI Removal of **carbon dioxide** from **waste gases** using calcium chloride from the Solvay soda process

IN Legat, Werner

PA Solvay Umweltchemie GmbH, Germany

SO Ger. Offen., 3 pp.

CODEN: GWXXBX

DT Patent

LA German

IC ICM B01D053-34

ICS C01D007-18; C01F011-24

CC 59-4 (**Air** Pollution and Industrial Hygiene)

Section cross-reference(s): 49

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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PI DE 4308250 A1 19940922 DE 1993-4308250 19930316

PRAI DE 1993-4308250 19930316

AB CO₂ is adsorbed in the presence of NaOH, KOH, Fe(OH)₃ or Al(OH)₃ using CaCl₂ and forming CaCO₃.

ST carbon dioxide absorption calcium chloride

IT **Flue gases**

(removal of **carbon dioxide** from **waste gases** using calcium chloride from the Solvay soda process)

IT **471-34-1, Calcium carbonate, formation (nonpreparative)**

RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)

(removal of **carbon dioxide** from **waste**

gases using calcium chloride from the Solvay soda process)

IT 497-19-8, Soda, miscellaneous

RL: MSC (Miscellaneous)

(removal of **carbon dioxide** from waste
gases using calcium chloride from the Solvay soda process)

IT 1332-37-2, Iron oxide, uses 1344-28-1, Aluminum oxide 10043-52-4,
 Calcium chloride, uses 11113-66-9, Iron hydroxide 21645-51-2, Aluminum
 hydroxide, uses
 RL: NUU (Other use, unclassified); USES (Uses)
 (removal of **carbon dioxide** from waste
gases using calcium chloride from the Solvay soda process)

IT 124-38-9, **Carbon dioxide**, processes
 RL: POL (Pollutant); REM (Removal or disposal); OCCU
 (Occurrence); PROC (Process)
 (removal of **carbon dioxide** from waste
gases using calcium chloride from the Solvay soda process)

L55 ANSWER 30 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
 AN 1993:656269 HCAPLUS
 DN 119:256269
 ED Entered STN: 11 Dec 1993
 TI Anticorrosion compositions used in **water** systems, wastewater
 treatment, and flue gas desulfurization
 IN Ferrara, Marcello; Scopelliti, Maria Gabriella
 PA Meg S.N.C. Di Scopelliti Sofia and C., Italy
 SO PCT Int. Appl., 43 pp.
 CODEN: PIXXD2
 DT Patent
 LA English
 IC ICM C02F001-00
 ICS C02F005-08; C02F005-02; C02F001-52
 CC 61-8 (Water)
 Section cross-reference(s): 59, 60
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 9320013	A1	19931014	WO 1993-IT26	19930329
	W: AU, BR, CA, FI, JP, KR, NO, RU, US RW: AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE				
	CA 2110066	AA	19931014	CA 1993-2110066	19930329
	AU 9339039	A1	19931108	AU 1993-39039	19930329
	EP 603345	A1	19940629	EP 1993-908063	19930329
	R: BE, DE, DK, ES, FR, GB, NL, SE				
	JP 07500286	T2	19950112	JP 1993-517281	19930329
	US 5683587	A	19971104	US 1995-580487	19951229
	US 5961837	A	19991005	US 1997-879656	19970620
PRAI	IT 1992-ME2		19920330		
	IT 1992-ME6		19920527		
	IT 1992-ME7		19920618		
	WO 1993-IT26		19930329		
	US 1993-142463		19931126		
	US 1995-580487		19951229		
AB	A process and water composition to reduce ≥ 1 of the following corrosion, scale, fouling, and biofouling in water treatment; wastewater treatment and/or solid and/or sludge disposal problems; and SO _x , NO _x and CO ₂ in a gaseous mixture involves using Na ₂ CO ₃ NaHCO ₃ supplemented with lime and/or NaOH and minor amts. of polymers, phosphonates, biocides, and antifoaming agents to treat the water . The formed sludges are fed to a desulfurization unit to remove SO _x , NO _x and CO ₂ .				
ST	corrosion prevention water purifn; wastewater treatment sludge				

disposal; flue gas desulfurization anticorrosion compn
 IT Flue gases
 (sulfur oxide and nitrogen oxide removal from, corrosion prevention
 water treatment combined with process for)
 IT Water purification
 (corrosion prevention, of recirculating water, formulated
 compns. for)
 IT Wastewater treatment
 (corrosion prevention, of sewage effluents, formulated compns. for)
 IT 7440-50-8, Copper, reactions
 RL: PEP (Physical, engineering or chemical process); PROC (Process)
 (corrosion of, prevention of, water treatment for)
 IT 144-55-8, Sodium bicarbonate, reactions 497-19-8, Sodium
 carbonate, reactions 1310-73-2, Sodium hydroxide, reactions
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (corrosion prevention water treatment with)
 IT 124-38-9, Carbon dioxide, miscellaneous
 11104-93-1, Nitrogen oxide, miscellaneous 12624-32-7, Sulfur oxide
 RL: REM (Removal or disposal); PROC (Process)
 removal of, from flue gases and waste
 gases, corrosion prevention water treatment combined
 with process for)
 IT 57-13-6, Urea, uses 64-18-6, Formic acid, uses 74-82-8, Methane, uses
 77-92-9, Citric acid, uses 471-34-1, Calcium
 carbonate, uses 584-08-7, Potassium carbonate
 1305-62-0, Calcium hydroxide, uses 1305-78-8, Calcium oxide, uses
 1309-42-8, Magnesium hydroxide 1309-48-4, Magnesium oxide, uses
 1317-38-0, Copper oxide (CuO), uses 7487-88-9, Magnesium sulfate, uses
 7647-14-5, Sodium chloride, uses 7664-41-7, Ammonia, uses 7757-82-6,
 Sodium sulfate, uses 7757-83-7, Sodium sulfite 7783-06-4, Hydrogen
 sulfide, uses
 RL: USES (Uses)
 (sorbent, in wastewater treatment)

L55 ANSWER 31 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
 AN 1993:677881 HCAPLUS
 DN 119:277881
 ED Entered STN: 25 Dec 1993
 TI Method and apparatus for gas-liquid contacting
 IN Smith, James W.; Ellenor, David Todd R.; Harbinson, John N.
 PA University of Toronto Innovations Foundation, Can.; Apollo Environmental
 Systems Corp.
 SO PCT Int. Appl., 90 pp.
 CODEN: PIXXD2
 DT Patent
 LA English
 IC ICM B01D053-18
 ICS B01F003-04; B03D001-16; A62D003-00; C01B017-05; C02F001-24
 CC 59-4 (Air Pollution and Industrial Hygiene)
 Section cross-reference(s): 48, 60

FAN.CNT 3

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 9319836	A1	19931014	WO 1993-CA148	19930405
	W:	AT, AU, BB, BG, BR, CA, CH, CZ, DE, DK, ES, FI, GB, HU, JP, KP, KR, LK, LU, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SK, UA, US			
	RW:	AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE,			

	BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG			
CA 2004652	AA	19910605	CA 1989-2004652	19891205
CA 2004652	C	19990831		
US 5352421	A	19941004	US 1992-863720	19920403
AU 9338850	A1	19931108	AU 1993-38850	19930405
AU 667093	B2	19960307		
ZA 9302464	A	19941005	ZA 1993-2464	19930405
EP 633810	A1	19950118	EP 1993-907723	19930405
	R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LI, LU, MC, NL, PT, SE			
JP 07507005	T2	19950803	JP 1993-516938	19930405
JP 10244122	A2	19980914	JP 1998-22062	19930405
CA 2133454	C	20010724	CA 1993-2133454	19930405
US 5413765	A	19950509	US 1994-230230	19940420
NO 9403651	A	19941202	NO 1994-3651	19940930
FI 9404613	A	19941124	FI 1994-4613	19941003
US 5520818	A	19960528	US 1994-313153	19941129
US 5730784	A	19980324	US 1995-462692	19950605
AU 9650808	A1	19960627	AU 1996-50808	19960423
AU 678936	B2	19970612		
AU 9650809	A1	19960627	AU 1996-50809	19960423
AU 679407	B2	19970626		
PRAI	US 1992-863720	A2	19920403	
	CA 1989-2004652	A	19891205	
	US 1989-446776	B2	19891206	
	GB 1990-2462	A	19900205	
	US 1990-582423	B2	19900914	
	US 1990-622485	A2	19901205	
	US 1992-863729	A2	19920403	
	JP 1993-516938	A3	19930405	
	WO 1993-CA148	A	19930405	
	US 1994-313153	A1	19941129	

AB Components, usually but not exclusively gaseous components, are removed from gas or liquid streams using a liquid or gas, resp., and chemical converted into an insol. phase or phys. removed. H₂S may be removed from gas streams by oxidation in **aqueous** chelated transition metal solution in a modified agitated flotation cell. The same principle may be employed with other procedures in which a gaseous phase is dispersed in a liquid phase to effect an interaction between components present in such phases, for example, to treat or strip or react a component of the liquid phase. The gas-liquid contacting apparatus may be a combined chemical reactor and solid product

separation device. In order to effect efficient mass transfer and rapid reaction, gas bubbles are formed by rotating an impeller at a blade tip velocity of .gtorsim.350 in/s to achieve the required shear. To assist in the reaction, a surrounding shroud has a plurality of openings, generally of aspect ratio of approx. 1, of equal diameter and arranged in uniform pattern, such as to provide a gas flow there through .ltorsim.0.02 lb/min-opening in the shroud. In general, the gas velocity index of gas through the openings in the shroud is .gtorsim.18/s-opening, preferably .gtorsim.24/s-opening. Each of the openings has an area corresponding to an equivalent diameter .ltorsim.1 in.

ST hydrogen sulfide removal **waste gas**; sulfur dioxide removal **waste gas**; **carbon dioxide** removal **waste gas**; gas liq contacting

IT Wastewater treatment
(removal of gases and volatile components in gas-liquid contact apparatus)

IT **Waste gases**
(removal of hydrogen sulfide and sulfur dioxide from **waste**)

gas streams in **gas**-liquid contact apparatus)
IT Contacting apparatus
(gas-liquid, for removal of gases from or with liqs.)
IT 7487-88-9, Magnesium sulfate, uses
RL: USES (Uses)
(anticaking agent, in hydrogen sulfide oxidation with **aqueous** iron chelate for **waste gas** treatment)
IT 1305-62-0, Calcium hydroxide, uses
RL: USES (Uses)
(for **carbon dioxide** removal from **waste** gas streams in **gas**-liquid contact apparatus)
IT 471-34-1P, Calcium **carbonate**, preparation
RL: FORM (Formation, nonpreparative); PREP (Preparation)
(formation of, in **carbon dioxide** removal from **waste gas** streams in **gas**-liquid contact apparatus)
IT 7704-34-9P, Sulfur, preparation 7778-18-9P, Calcium sulfate
10257-55-3P, Calcium sulfite
RL: FORM (Formation, nonpreparative); PREP (Preparation)
(formation of, in hydrogen sulfide oxidation with **aqueous** iron chelate for **waste gas** treatment)
IT 11113-66-9, Iron hydroxide
RL: OCCU (Occurrence)
(hydrogen sulfide oxidation in presence of **aqueous** iron chelate and, for removal from **waste gas** streams with **gas**-liquid contact apparatus)
IT 15275-07-7, Iron EDTA 17084-02-5
RL: OCCU (Occurrence)
(hydrogen sulfide oxidation in presence of **aqueous**, for removal from **waste gas** streams with **gas**-liquid contact apparatus)
IT 1310-73-2, Sodium hydroxide, uses 7782-44-7, Oxygen, uses
RL: USES (Uses)
(in hydrogen sulfide oxidation with **aqueous** iron chelate for **waste gas** treatment)
IT 1330-78-5, Tricresyl phosphate 7664-38-2P, Phosphoric acid, preparation
RL: OCCU (Occurrence)
(in solution for removal of sulfur dioxide from **waste** gas streams in **gas**-liquid contact apparatus)
IT 7757-82-6, Sodium sulfate, miscellaneous
RL: MSC (Miscellaneous)
(precipitation of, in hydrogen sulfide oxidation with **aqueous** iron chelate for **waste gas** treatment)
IT 7446-09-5, Sulfur dioxide, miscellaneous 7783-06-4, Hydrogen sulfide, miscellaneous
RL: REM (Removal or disposal); PROC (Process)
(removal of, from **waste gas** streams, by oxidation in **aqueous** chelated transition metal solution, with **gas**-liquid contact apparatus)
IT 124-38-9, Carbon **dioxide**, miscellaneous
RL: REM (Removal or disposal); PROC (Process)
(removal of, from **waste gas** streams, with calcium hydroxide in **gas**-liquid contact apparatus)

L55 ANSWER 32 OF 54 HCPLUS COPYRIGHT 2004 ACS on STN
AN 1994:37267 HCPLUS
DN 120:37267
ED Entered STN: 22 Jan 1994
TI Removal of **carbon dioxide** and sulfur oxides from

combustion waste gases

IN Fujii, Masumi; Suda, Taiichiro; Hotsuta, Zenji; Kobayashi, Kenji; Yoshida, Kunihiko; Shimojo, Shigeru; Kitamura, Koichi; Kawasaki, Masami; Seto, Tooru; Et, Al.

PA Kansai Electric Power Co, Japan; Mitsubishi Heavy Industries, Ltd.
SO Jpn. Kokai Tokkyo Koho, 8 pp.

CODEN: JKXXAF

DT Patent

LA Japanese

IC ICM B01D053-34

ICS B01D053-34; F23J015-00

CC 59-4 (**Air Pollution** and Industrial Hygiene)

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 05245338	A2	19930924	JP 1992-45244	19920303
	JP 3305001	B2	20020722		
PRAI	JP 1992-45244		19920303		

AB The process comprises desulfurizing the gases by a high-performance desulfurization process to have SO_x concentration in the treated **gases** 5-10 ppm, removing CO₂ by contacting the **gases** with an aqueous alkanolamine solution, and simultaneously removing SO_x to have SO_x concentration in the gases ≤1 ppm. The process saves energy for desulfurization and expensive alkanolamines.

ST **carbon dioxide removal waste gas;**
sulfur oxide removal **waste gas;** alkanolamine carbon dioxide removal

IT **Waste gases**

(**carbon dioxide** and sulfur oxide removal from,
high-performance desulfurization process and alkanolamine treatment
for)

IT Alcohols, uses

RL: USES (Uses)

(amino, **waste gases** treatment with, for
carbon dioxide and sulfur dioxide removal)

IT 12624-32-7, Sulfur oxide

RL: REM (Removal or disposal); PROC (Process)
(removal of, from combustion **waste gases**,
carbon dioxide removal and)

IT 124-38-9, **Carbon dioxide**, miscellaneous

RL: REM (Removal or disposal); PROC (Process)
(removal of, from combustion **waste gases**,
desulfurization and)

IT 471-34-1, **Calcium carbonate**, miscellaneous

RL: MSC (Miscellaneous)
(slurry containing, **waste gases** treatment with, for
sulfur oxide removal)

IT 141-43-5, Monoethanolamine, miscellaneous

RL: MSC (Miscellaneous)
(**waste gases** treatment with, for **carbon**
dioxide and sulfur dioxide removal)

L55 ANSWER 33 OF 54 HCPLUS COPYRIGHT 2004 ACS on STN

AN 1993:566876 HCPLUS

DN 119:166876

ED Entered STN: 16 Oct 1993

TI Manufacture of iron oxide-based catalysts for **waste gas**
treatment

IN Aoki, Isataka; Matsui, Toshiki; Imai, Tomoyuki; Horiishi, Nanao
 PA Toda Kogyo Corp, Japan
 SO Jpn. Kokai Tokkyo Koho, 6 pp.

CODEN: JKXXAF

DT Patent

LA Japanese

IC ICM B01J023-74

ICS B01D053-36; B01J037-02

CC 59-3 (**Air Pollution** and Industrial Hygiene)
 Section cross-reference(s): 67

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 05177139	A2	19930720	JP 1991-359298	19911227
	JP 3107109	B2	20001106		
PRAI	JP 1991-359298		19911227		
AB The title catalysts are manufactured by immersing a monolithic ceramic or metallic support in aqueous solns. of Fe(II) salts and Fe(III) salts and precipitating particles of magnetite on the supports by immersing the impregnated support into aqueous solns. of alkali hydroxides or carbonates . The catalysts show good mech. strength.					
ST	exhaust gas treatment catalyst; flue gas treatment catalyst; iron oxide catalyst waste gas ; magnetite catalyst waste gas treatment				
IT	Exhaust gases Flue gases (catalysts for treatment of, iron oxide on ceramic or metallic supports as, manufacture of)				
IT	Catalysts and Catalysis (iron oxide-based, on monolithic ceramic or metallic supports, for waste gas treatment)				
IT	Ceramic materials and wares (supports, monolithic, for iron oxide catalysts, for waste gas treatment)				
IT	Synthetic fibers RL: USES (Uses) (aluminum silicate, supports, monolithic, for iron oxide catalysts, for waste gas treatment)				
IT	Synthetic fibers RL: USES (Uses) (silica, supports, monolithic, for iron oxide catalysts, for waste gas treatment)				
IT	Synthetic fibers RL: USES (Uses) (zirconium oxide, supports, monolithic, for iron oxide catalysts, for waste gas treatment)				
IT	1309-38-2P, Magnetite, uses 1317-60-8P, Hematite, uses RL: CAT (Catalyst use); PREP (Preparation); USES (Uses) (catalysts, on ceramic or metallic supports, manufacture of, for waste gas treatment)				
IT	1314-23-4, Zirconia, miscellaneous 7631-86-9, Silica, miscellaneous RL: MSC (Miscellaneous) (ceramics, fiber, monolithic supports, for iron oxide catalysts, for waste gas treatment)				
IT	7705-08-0, Ferric chloride, miscellaneous 7720-78-7, Ferrous sulfate 10028-22-5, Ferric sulfate RL: MSC (Miscellaneous) (impregnation with, of ceramic or metallic supports, in manufacture of iron				

oxide-based catalysts for **waste gas** treatment)

IT 124-38-9, Carbon dioxide, miscellaneous
 RL: REM (Removal or disposal); PROC (Process)
 (removal of, from **waste gases**, iron oxide-based
 catalysts for)

IT 1302-88-1, Cordierite 150286-23-0
 RL: USES (Uses)
 (supports, monolithic, for iron oxide catalysts, for **waste**
gas treatment)

L55 ANSWER 34 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
 AN 1993:566875 HCAPLUS
 DN 119:166875
 ED Entered STN: 16 Oct 1993
 TI Manufacture of iron oxide-based catalysts for **waste gas**
 treatment
 IN Aoki, Isataka; Matsui, Toshiki; Imai, Tomoyuki; Horiishi, Nanao
 PA Toda Kogyo Corp, Japan
 SO Jpn. Kokai Tokkyo Koho, 6 pp.
 CODEN: JKXXAF
 DT Patent
 LA Japanese
 IC ICM B01J023-74
 ICS B01D053-36; B01J037-02
 CC 59-3 (**Air Pollution** and Industrial Hygiene)
 Section cross-reference(s): 67

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 05177138	A2	19930720	JP 1991-359297	19911227
	JP 3107108	B2	20001106		
PRAI	JP 1991-359297		19911227		
AB	The title catalysts are manufactured by immersing a monolithic ceramic or metallic support in aqueous solns. of Fe(II) salts, immersing the impregnated support into aqueous solns. of alkali hydroxides or carbonates , precipitating particles of water -containing Fe ₂ O ₃ on the supports by blowing O-containing gas, washing, drying, and precipitating particles of magnetite on the supports by immersing the Fe ₂ O ₃ -deposited support in aqueous solns. of Fe(OH) ₂ . The catalysts show good mech. strength.				
ST	exhaust gas treatment catalyst; flue gas treatment catalyst; iron oxide catalyst waste gas ; magnetite catalyst waste gas treatment				
IT	Exhaust gases Flue gases (catalysts for treatment of, iron oxide on ceramic or metallic supports as, manufacture of)				
IT	Catalysts and Catalysis (iron oxide-based, on monolithic ceramic or metallic supports, for waste gas treatment)				
IT	Ceramic materials and wares (supports, monolithic, for iron oxide catalysts, for waste gas treatment)				
IT	Synthetic fibers RL: USES (Uses) (aluminum silicate, supports, monolithic, for iron oxide catalysts, for waste gas treatment)				
IT	Synthetic fibers				

RL: USES (Uses)
 (silica, supports, monolithic, for iron oxide catalysts, for
waste gas treatment)

IT Synthetic fibers
 RL: USES (Uses)
 (zirconium oxide, supports, monolithic, for iron oxide catalysts, for
waste gas treatment)

IT 1309-38-2P, Magnetite, uses 1310-14-1P, Goethite 1317-60-8P, Hematite,
 uses
 RL: CAT (Catalyst use); PREP (Preparation); USES (Uses)
 (catalysts, on ceramic or metallic supports, manufacture of, for
waste gas treatment)

IT 1314-23-4, Zirconia, miscellaneous 7631-86-9, Silica, miscellaneous
 RL: MSC (Miscellaneous)
 (ceramics, fiber, monolithic supports, for iron oxide catalysts, for
waste gas treatment)

IT 7720-78-7, Iron sulfate (FeSO₄) 18624-44-7, Ferrous hydroxide
 RL: USES (Uses)
 (impregnation with, of ceramic or metallic supports, in manufacture of iron
 oxide-based catalysts for **waste gas** treatment)

IT 124-38-9, Carbon dioxide, miscellaneous
 RL: REM (Removal or disposal); PROC (Process)
 (removal of, from **waste gases**, iron oxide-based
 catalysts for)

IT 1302-88-1, Cordierite 150286-23-0
 RL: USES (Uses)
 (supports, monolithic, for iron oxide catalysts, for **waste**
gas treatment)

L55 ANSWER 35 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
 AN 1994:306404 HCAPLUS
 DN 120:306404
 ED Entered STN: 11 Jun 1994
 TI Process and devices for utilization and treatment of **waste**
gases
 IN Shuhan, Liao
 PA Peop. Rep. China
 SO Faming Zhuanli Shenqing Gongkai Shuomingshu, 32 pp.
 CODEN: CNXXEV
 DT Patent
 LA Chinese
 IC ICM B01D053-34
 ICS B01D053-18; B01D047-04; F22B001-18; F27D017-00
 CC 59-4 (**Air Pollution** and Industrial Hygiene)
 FAN.CNT 1

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI CN 1077657	A	19931027	CN 1992-102885	19920417
PRAI CN 1992-102885		19920417		

AB **Waste gases** are treated by driving the gases by a fan
 through a foam layer of an absorbent solution generated in a foam generator,
 to sep. components from the gas by the phys. and chemical reactions between
 the absorbent and the components, and recovering the components sep. by a
 foam reducer, a crystallizing container, an atomizer, a heat exchanger, and/or
 a filter. The absorbent solution may be an **aqueous** or oil solution and may
 contain additives selected from foaming agents, sodium **carbonate**
 , sodium **bicarbonate**, cadmium hydroxide and sodium hydroxide.

This method is useful for removing particles and tar from the **gas**, recovering **waste** heat from the **gas** to generate steam and hot **water**, recovering SO₂ as Na₂SO₃ or NaHSO₃, and recovering CO₂ as lightwt. CaCO₃. The devices include chambers for removing dust, generating steam, producing distilled **water**, recovering Na₂SO₃, and recovering lightwt. CaCO₃; and comprises foam generators, foam reducers, means for controlling solution level, foam detectors, raw material supplying means, filters, atomizers, crystallizing containers, heat exchangers, blowers, valves, thermal insulators, pipes, and man holes.

ST **waste gas** treatment foam method; dust removal
waste gas; sulfur dioxide removal **waste**
gas; **carbon dioxide** removal **waste**
gas; heat recovery **waste gas**; tar removal
waste gases

IT Tar
RL: REM (Removal or disposal); PROC (Process)
(removeal of, from **waste gases**, method and apparatus for)

IT **Waste gases**
(treatment and utilization of, method and apparatus for)

IT Heat
(**waste**, recovery of, from **waste gases**,
method and apparatus for)

IT **471-34-1P**, Calcium **carbonate**, preparation
RL: PREP (Preparation)
(manufacture of lightwt., from **carbon dioxide** in
waste gases, method and apparatus for)

IT 7681-38-1P, Sodium bisulfate 7757-83-7P, Sodium sulfite
RL: IMF (Industrial manufacture); PREP (Preparation)
(manufacture of, from sulfur dioxide in **waste gases**,
method and apparatus for)

IT **124-38-9**, **Carbon dioxide**, miscellaneous
7446-09-5, Sulfur dioxide, miscellaneous
RL: REM (Removal or disposal); PROC (Process)
(removeal of, from **waste gases**, method and apparatus for)

L55 ANSWER 36 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1993-387580 [49] WPIX
DNC C1993-172409

TI Ammonia and organic cpds. recovery from gas also containing carbon di oxide - especially from bis urethane production by scrubbing with **aqueous** alkali in combined absorption and rectification column and separating **aqueous** alkali **carbonate** solution.

DC E19 E35
IN HEITMANN, W
PA (CHEM) HUELS AG
CYC 7

PI DE 4217921 A1 19931202 (199349)* 6p C01C001-12
EP 572778 A2 19931208 (199349) DE C01C001-12
R: BE DE FR GB IT
JP 06115928 A 19940426 (199421) 6p C01C001-12
EP 572778 A3 19940309 (199520) C01C001-12
US 5427759 A 19950627 (199531) 5p C01C001-00
EP 572778 B1 19960619 (199629) DE 8p C01C001-12
R: BE DE FR GB IT
DE 59302990 G 19960725 (199635) C01C001-12
ADT DE 4217921 A1 DE 1992-4217921 19920530; EP 572778 A2 EP 1993-105392
19930401; JP 06115928 A JP 1993-127549 19930528; EP 572778 A3 EP

1993-105392 19930401; US 5427759 A Cont of US 1993-69835 19930601, US
 1994-288232 19940809; EP 572778 B1 EP 1993-105392 19930401; DE 59302990 G
 DE 1993-502990 19930401, EP 1993-105392 19930401

FDT DE 59302990 G Based on EP 572778

PRAI DE 1992-4217921 19920530

REP CA 943324

IC ICM C01C001-12

ICS B01D053-34

ICA F25J003-02

AB DE 4217921 A UPAB: 19940126

Recovery of NH₃ and organic cpds. (I) from **gases** containing organic matter, CO₂ and NH₃ involves removing CO₂ by scrubbing with **aqueous** alkali solution (II) in a combined absorption and rectification column, discharging NH₃ as top prod. and recovering pure (I) from the sump prod. containing alkali **carbonate** (III) and (I) after separating (III).

Pref. the sump of the column operates at the boiling temperature of the mixture of (III) solution and (I). (II) is an **aqueous** NaOH or KOH solution pref. 10-20 (weight)% NaOH solution The (III) solution is separated by decanting.

Water is recovered from the organic phase by distillation and used for dilution of (II).

USE/ADVANTAGE - The process is used for recovering NH₃ and (I) from **waste** gas from bisurethane (IV) production from diamine, urea and alcohol (claimed). NH₃ is recovered as such rather than as (NH₄)₂SO₄, the supply of which already greatly exceeds the demand.

Dwg.0/1

FS CPI

FA AB; DCN

MC CPI: E11-Q01; E32-A01

L55 ANSWER 37 OF 54 HCPLUS COPYRIGHT 2004 ACS on STN

AN 1992:577442 HCPLUS

DN 117:177442

ED Entered STN: 01 Nov 1992

TI Treatment of **carbon dioxide**-containing **gases**

IN Kuramoto, Masamichi; Asano, Yoshihiko

PA Meidensha Corp., Japan

SO Jpn. Kokai Tokkyo Koho, 6 pp.

CODEN: JKXXAF

DT Patent

LA Japanese

IC ICM B01D053-34

ICS C02F001-46

CC 59-3 (**Air Pollution** and Industrial Hygiene)

FAN.CNT 1

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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PI JP 04135622	A2	19920511	JP 1990-257749	19900927
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PRAI JP 1990-257749		19900927		
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AB The gases are treated by introducing the gases into an **aqueous** solution containing Ca²⁺, depositing CaCO₃ from the solution on a neg. electrode at <50 μ A/cm² c.d., and separating the deposit from the electrode by passing a current in an opposite direction at 100-140 μ A/cm² c.d. The gases may be exhaust gases from diesel or gasoline engine or gas turbines.

ST exhaust **gas carbon dioxide** removal; calcium compd carbon dioxide removal; electrodeposition carbon dioxide removal; **waste gas carbon dioxide** removal

IT **Exhaust gases**
 (carbon dioxide removal from, by electrodeposition
 as calcium carbonate)

IT **Waste gases**
 (from gas turbines, carbon dioxide
 removal from, by electrodeposition as calcium carbonate)

IT Electrodeposition and Electroplating
 (in carbon dioxide removal from exhaust and
 waste gases, as calcium carbonate
)

IT 1305-62-0, Calcium hydroxide, miscellaneous
 RL: MSC (Miscellaneous)
 (in carbon dioxide removal from exhaust and
 waste gases, by electrodeposition as calcium
 carbonate)

IT 471-34-1, Calcium carbonate, miscellaneous
 RL: MSC (Miscellaneous)
 (removal of carbon dioxide as, by
 electrodeposition, from exhaust and waste gases)

IT 124-38-9, Carbon dioxide, miscellaneous
 RL: REM (Removal or disposal); PROC (Process)
 (removal of, from exhaust and waste gases, by
 electrodeposition as calcium carbonate)

L55 ANSWER 38 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
 AN 1992:496544 HCAPLUS
 DN 117:96544
 ED Entered STN: 05 Sep 1992
 TI Absorbent solution for carbon dioxide removal in corrosion prevention of
 steel piping
 IN Sekine, Isao; Yuasa, Makoto; Shimoide, Tetsuya; Takaoka, Koichi
 PA Kyoba Plant Engineering K. K., Japan
 SO Jpn. Kokai Tokkyo Koho, 6 pp.
 CODEN: JKXXAF
 DT Patent
 LA Japanese
 IC ICM B01D053-34
 ICS B01D053-14; C23F011-06
 ICA C10M135-28; C10M141-10
 ICI C10M141-10, C10M135-28, C10M137-12, C10M133-08; C10N030-12
 CC 59-4 (Air Pollution and Industrial Hygiene)
 Section cross-reference(s): 55

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 04035721	A2	19920206	JP 1990-139928	19900531
	JP 06015014	B4	19940302		
PRAI	JP 1990-139928		19900531		

AB An aqueous solution containing carbonate salts and ≥30
 ppm, preferably 50-500 ppm, of 2-aminothiophenol (I), and optionally
 1-hydroxyethylidene-1,1-diphosphonic acid and/or diethanolamine, is useful
 for adsorbing CO₂ from process gas to prevent
 corrosion in steel piping. Thus, an SS41-steel test plate was immersed
 into a 23 weight% Na₂CO₃ aqueous solution containing 100 ppm of I and then
 saturated with CO₂ gas, resulting in corrosion inhibition
 of 95.5%, vs. 73.3% for a conventional method.

ST carbon dioxide removal gas absorbent;
 waste gas carbon dioxide adsorbent;

aminothiophenol absorbent carbon dioxide

IT **Waste gases**
 (**carbon dioxide** removal from, absorbent solution for,
 in corrosion prevention of steel pipings)

IT 497-19-8, Sodium **carbonate**, uses
 RL: USES (Uses)
 (absorbent solution containing aminothiophenol and, for **carbon dioxide** removal from **gases**, in corrosion prevention of steel piping)

IT 137-07-5, 2-Aminothiophenol 2809-21-4, 1-Hydroxyethylidene-1,1-diphosphonic acid 111-42-2, Diethanolamine, uses
 RL: OCCU (Occurrence)
 (absorbent solution containing **carbonate** salt and, for **carbon dioxide** removal from **gases**, in corrosion prevention of steel piping)

IT **124-38-9, Carbon dioxide**, miscellaneous
 RL: REM (Removal or disposal); PROC (Process)
 (removal of, from **waste gases**, absorbent solution for, in corrosion prevention of steel piping)

L55 ANSWER 39 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
 AN 1992:638969 HCAPLUS
 DN 117:238969
 ED Entered STN: 13 Dec 1992
 TI Removal of **carbon dioxide** from flue **gases** by scrubbing with milk of lime.
 IN Pomplun, Dieter
 PA Germany
 SO Ger. Offen., 4 pp.
 CODEN: GWXXBX
 DT Patent
 LA German
 IC ICM B01D053-34
 ICS F01N003-10; F01N005-02
 CC 59-4 (**Air** Pollution and Industrial Hygiene)
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	DE 4038068	A1	19920604	DE 1990-4038068	19901129
PRAI	DE 1990-4038068		19901129		
AB	CO₂ is removed from flue gases or from exhaust gases by scrubbing with milk of lime, producing calcium carbonate which is then calcined to form quicklime and CO ₂ . The quicklime is quenched and the excess milk of lime is recycled to the process.				
ST	calcium hydroxide exhaust gas scrubbing; waste gas scrubbing lime milk; recycling lime milk gas scrubbing				
IT	Recycling (of calcium hydroxide, in scrubbing of waste gases)				
IT	Exhaust gases (Flue gases (scrubbing of, calcium hydroxide in, recycling in))				
IT	471-34-1P, Calcium carbonate , preparation RL: FORM (Formation, nonpreparative); PREP (Preparation) (formation of, in scrubbing waste gases , recycling in relation to)				
IT	1305-62-0, Calcium hydroxide, miscellaneous RL: MSC (Miscellaneous) (recycling of, in removal of carbon dioxide from				

flue gases)

IT 124-38-9, Carbon dioxide, miscellaneous
 RL: REM (Removal or disposal); PROC (Process)
 (removal of, from waste gases by scrubbing with
 calcium hydroxide, recycling in)

L55 ANSWER 40 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
 AN 1991:253298 HCAPLUS

DN 114:253298

ED Entered STN: 28 Jun 1991

TI Removal of carbon dioxide from waste
 gases

IN Sato, Shinichiro; Kitajima, Nobuyuki; Yajima, Satoshi

PA Fujita Corp., Japan

SO Jpn. Kokai Tokkyo Koho, 3 pp.

CODEN: JKXXAF

DT Patent

LA Japanese

IC ICM B01D053-34

CC 59-4 (Air Pollution and Industrial Hygiene)

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 03056121	A2	19910311	JP 1989-188720	19890724
	JP 06075666	B4	19940928		
PRAI	JP 1989-188720		19890724		

AB CO₂ is removed from waste gases by contacting the gases with aqueous alkali to absorb CO₂ as carbonate salts, subjecting the aqueous solns. to a CO₂ fixation process using a culture tank containing alkalophilic bacteria or fungi, and recycling the carbonate-depleted culture medium as aqueous alkali in the CO₂ absorption process. The method is simple and efficient and is useful for treatment of waste gases and flue gases from power plants, municipal incinerator plants, etc.

ST carbon dioxide removal waste gas;
 flue gas carbon dioxide removal;
 fixation biol carbon dioxide gas;
 scrubbing alkali gas carbon dioxide;
 alkalophilic bacteria carbon dioxide fixation

IT Fungi
 (alkalophilic, carbon dioxide fixation
 by, in waste gas treatment)

IT Spirulina platensis
 (carbon dioxide fixation by, in
 waste gas treatment)

IT Flue gases
 Waste gases
 (carbon dioxide removal from, by alkali scrubbing
 and biol. fixation)

IT Bacteria
 (alkalophilic, carbon dioxide fixation
 by, in waste gas treatment)

IT Scrubbing
 (wet, of waste gases, by aqueous alkali, for
 carbon dioxide removal)

IT 124-38-9, Carbon dioxide, uses and
 miscellaneous

RL: REM (Removal or disposal); PROC (Process)
 (removal of, from waste gases, by alkali scrubbing
 and biol. fixation)

L55 ANSWER 41 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
 AN 1991:149330 HCAPLUS
 DN 114:149330
 ED Entered STN: 19 Apr 1991
 TI Process for selective absorption of chlorine from waste
 gases containing carbon dioxide
 IN Girrbach, Ulrich; Grimm, Richard; Haertl, Edgar; Malow, Egon
 PA Hoechst A.-G., Germany
 SO Eur. Pat. Appl., 4 pp.
 CODEN: EPXXDW
 DT Patent
 LA German
 IC ICM B01D053-34
 ICS B01D053-14
 CC 59-4 (Air Pollution and Industrial Hygiene)
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	EP 406675	A1	19910109	EP 1990-112184	19900627
	EP 406675	B1	19940413		
	R: BE, CH, DE, FR, GB, IT, LI, NL				
	DE 3921714	A1	19910110	DE 1989-3921714	19890701
	JP 03131319	A2	19910604	JP 1990-170344	19900629
	BR 9003060	A	19910827	BR 1990-3060	19900629
	US 5102638	A	19920407	US 1990-546244	19900629
PRAI	DE 1989-3921714		19890701		
AB	Cl ₂ is selectively removed from waste gases containing CO ₂ by scrubbing with an aqueous solution containing NaHCO ₃ 0.1-10 and NaHSO ₃ 0.01-5 weight%, preferably 1-5 and 0.1-0.5 wt%, resp.				
ST	chlorine scrubbing waste gas; bicarbonate bisulfite waste gas scrubbing				
IT	Waste gases (carbon dioxide-containing, selective removal of chlorine from, scrubbing with sodium bicarbonate and sodium bisulfite in)				
IT	Scrubbing (chlorine removal by, selective, from waste gases containing carbon dioxide, sodium bicarbonate and sodium bisulfite in)				
IT	7757-82-6, Disodium sulfate, uses and miscellaneous				
	RL: USES (Uses) (in selective removal of chlorine, from waste gases containing carbon dioxide)				
IT	7647-14-5P, Sodium chloride, preparation				
	RL: PREP (Preparation) (recovery of, in selective removal of chlorine, from waste gases containing carbon dioxide)				
IT	7782-50-5, Chlorine, uses and miscellaneous				
	RL: REM (Removal or disposal); PROC (Process) (removal of, from waste gases containing carbon dioxide, by scrubbing with sodium bicarbonate and sodium bisulfite)				
IT	144-55-8, Sodium bicarbonate, uses and miscellaneous 7631-90-5				
	RL: USES (Uses)				

(scrubbing solution containing, for selective removal of chlorine, from
waste gases containing **carbon dioxide**
)

L55 ANSWER 42 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
 AN 1991-092105 [13] WPIX
 DNC C1991-039520
 TI Removal and recovery of **carbonic** acid gas from exhaust gas - by
 absorbing gas using **aqueous** absorption liquid drawing off liquid and
 heating to release gas and regenerating absorption liquid.
 DC E36 J01
 PA (CHIY) CHIYODA CORP
 CYC 1
 PI JP 03038219 A 19910219 (199113)*
 JP 05021610 B 19930325 (199315) 5p B01D053-34
 ADT JP 03038219 A JP 1989-109960 19890703; JP 05021610 B JP 1989-169960
 19890703
 FDT JP 05021610 B Based on JP 03038219
 PRAI JP 1989-109960 19890703; JP 1989-169960 19890703
 IC ICM B01D053-34
 ICS C01B031-20
 AB JP 03038219 A UPAB: 19930928
Carbonic acid gas is recovered and removed from exhaust gas by:
 (I) **Carbonic** acid gas is absorbed by **aqueous** absorption
 liquid, (2) At least a part of the **aqueous** absorption liquid which has
 absorbed **carbonic** acid gas is drawn out and heated,
carbonic acid gas is released and the **aqueous** absorption
 liquid is reed; and (3) the regenerated **aqueous** absorption liquid is
 cooled, and returned to the absorption process (I). The **aqueous**
 absorption liquid contains a slurry which mainly consists of Na
carbonate and/or Na **bicarbonate**.

Pref. O₂-containing oxidising gas is introduced to the **aqueous**
 absorption liquid during (I) or between (I) and (2).

USE/ADVANTAGE Acid **gas**, specially CO₂ and SO₂, is
removed from exhaust gas, and high purity **carbonic** acid
 gas is recovered. In the case of boiler exhaust **gas**,
CO₂ can be recovered efficiently under conditions up to 150 deg.
 C. @ (5pp Dwg.No.0/2)

FS CPI
 FA AB; DCN
 MC CPI: E31-F01A; E31-N05C; E33-D; J01-E02A

L55 ANSWER 43 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
 AN 1982-28653E [14] WPIX
 TI Carbon di oxide measurement system - uses carrier stream for sample
 passage into spiral absorbing column which causes conductivity change.
 DC E36 J04 S03
 PA (CAME-I) CAMERON J N
 CYC 1
 PI US 4321545 A 19820323 (198214)* 7p
 PRAI US 1980-130086 19800313
 IC G01N027-42
 AB US 4321545 A UPAB: 19930915
 In a CO₂ measuring system, a sample is injected into an extraction chamber
 containing an acid solution for converting **bicarbonate** ion,
carbonate ion, and **carbonic** acid to dissolved
CO₂ gas. A carrier **gas** stream **removes**
 the **CO₂** from the chamber to a column for contact with an

alkaline solution which reabsorbs CO₂.

The carrier gas circulates the alkaline solution through detector cells. Analog and digital circuitry provides an automatically switched counting period, at the end of which the sample concentration is displayed.

Used for analysis of natural surface **waters**, sea **water**, blood, urine samples, culture media and gas samples. Quick and convenient analysis of samples containing as little as 2 x 10 power (-8) Moles of CO₂ can be made with samples as small as 5 microlitres.

FS CPI EPI

FA AB

MC CPI: E31-N05; J04-B01; J04-C04
EPI: S03-E03A; S03-E13D

L55 ANSWER 44 OF 54 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1982-97733E [46] WPIX

TI Waste **water** purificn. sludge treatment - with **carbonic** acid to convert iron-containing salt to soluble iron bi **carbonate** for recycling.

DC D15

IN KAEUFFER, K C

PA (AGSA-N) AGS AUSRUESTUNGSGES GEWAESSER; (KAUF-I) KAUFFER K C

CYC 8

PI EP 64279 A 19821110 (198246)* DE 14p

R: AT CH FR GB LI NL SE

DE 3117513 A 19821118 (198247)

EP 64279 B 19850710 (198528) DE

R: AT CH FR GB LI NL SE

DE 3117513 C 19901004 (199040)

ADT EP 64279 A EP 1982-103661 19820429

PRAI DE 1981-3117513 19810502

REP DE 1136285; DE 1517526; DE 2603773; DE 641793; US 3268443; US 3377272

IC C02F001-52; C02F011-14

AB EP 64279 A UPAB: 19930915

Waste **water** purificn. comprises mixing a neutral or acid waste **water** with Fe salts and opt. flocking auxiliaries, separating the forming sludge from the pure **water** and treating with acid having a concentration such that the Fe-containing substances but not the organic contents

pass into the solution. The solution obtd. is recycled to the neutral or acid waste **water**. Novelty consists of using H₂CO₃ as the acid and Fe(HCO₃)₂ as the Fe salt flocculant. The equipment used is claimed. Salt load formation in purified **water** is prevented.

Neutral waste **water** mixed with Fe(HCO₃)₂ is freed from CO₂ by applying reduced pressure or by stripping with a gas, especially air. The sludge is separated from the pure **water** by sedimentation, flotation or opt. filtration. The H₂CO₃ source can be flue **gas**.

CO₂ can be used under pressure. After sludge separation, the pure **water** is pref. passed through a cation exchanger, followed by CO₂ expulsion. Freed CO₂ is recycled as H₂CO₃.

FS CPI

FA AB

MC CPI: D04-B09

L55 ANSWER 45 OF 54 HCPLUS COPYRIGHT 2004 ACS on STN

AN 1983:131550 HCPLUS

DN 98:131550

ED Entered STN: 12 May 1984

TI Activation of potassium **carbonate** solutions used in the

AU absorption of **carbon dioxide** from **gases**
AU Jianu, Dumitru
CS Cent. Cercetare Pentru Ingrasaminte Chim., Craiova, Rom.
SO Revistade Chimie (Bucharest, Romania) (1982), 33(12), 1122-4
CODEN: RCBUAU; ISSN: 0034-7752
DT Journal
LA Romanian
CC 59-4 (**Air Pollution** and Industrial Hygiene)
AB The activation of K₂CO₃ solns. by As₂O₃, aminoacetic acid [56-40-6], monoethanolamine [141-43-5], diethanolamine [111-42-2], morpholine [110-91-8], and glycerol [56-81-5] in the absorption of CO₂ from **gases** was studied.
ST potassium carbonate sorbent activation; **carbon dioxide** removal **waste gas**
IT **Waste gases**
 (**carbon dioxide** removal from, potassium carbonate solution for, activators for)
IT 1327-53-3 **56-40-6**, uses and miscellaneous 56-81-5, uses and miscellaneous 110-91-8, uses and miscellaneous 111-42-2, uses and miscellaneous 141-43-5, uses and miscellaneous
 RL: OCCU (Occurrence)
 (in activation of potassium carbonate solns. for **carbon dioxide** removal from **gases**)
IT 124-38-9, uses and miscellaneous
 RL: REM (Removal or disposal); PROC (Process)
 removal of, from **gases** by adsorption in potassium carbonate solns., activators for)
IT 584-08-7
 RL: OCCU (Occurrence)
 (solution of, for **carbon dioxide** removal from **gases**, activators for)

L55 ANSWER 46 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 1980:452997 HCAPLUS
DN 93:52997
ED Entered STN: 12 May 1984
TI Wet dust removal from gases
IN Krueger, Berthold
PA Bischoff, Gottfried, Bau Kompletter. Gasreinigungs- und Wasserrueckkuehlanlagen G.m.b.H. und Co. K.-G., Fed. Rep. Ger.
SO Rom., 3 pp.
CODEN: RUXXA3
DT Patent
LA Romanian
IC B01D047-00; B01D053-00
CC 59-2 (**Air Pollution** and Industrial Hygiene)
FAN.CNT 2

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	RO 65892	P	19790115	RO 1974-80192	19741011
	DE 2350956	B1	19740516	DE 1973-2350956	19731011
PRAI	DE 1973-2350956		19731011		

AB **Gases** containing CaO and CO₂ were scrubbed with water containing 0.4-1 g Na₂CO₃ or NaOH to remove dust. The Na₂CO₃ or NaOH prevented CaCO₃ formation.
ST wet scrubbing dust calcium oxide
IT Dust
 removal of, from **waste gases**, scrubbing with solution

containing sodium **carbonate** or sodium hydroxide to prevent calcium **carbonate** formation)

IT Scrubbing
(wet, of **waste gases** for dust removal, solution containing sodium **carbonate** or hydroxide for)

IT 124-38-9, uses and miscellaneous 1305-78-8, uses and miscellaneous

RL: **REM (Removal or disposal); PROC (Process)**
(removal of, from **waste gases** by scrubbing with solution containing sodium **carbonate** or hydroxide)

IT 497-19-8, uses and miscellaneous 1310-73-2, uses and miscellaneous
RL: **USES (Uses)**
(scrubbing of **waste gases** containing **carbon dioxide** with solution containing, for calcium oxide removal)

L55 ANSWER 47 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN

AN 1978:411430 HCAPLUS

DN 89:11430

ED Entered STN: 12 May 1984

TI Method of removing hydrogen sulfide from a **gas carbon dioxide**

IN Schievelbein, Vernon Hugo

PA Texaco Development Corp., USA

SO Brit., 9 pp.

CODEN: BRXXAA

DT Patent

LA English

IC B01D053-34

CC 59-2 (Air Pollution and Industrial Hygiene)

FAN.CNT 1

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI GB 1495690	A	19771221	GB 1975-49130	19751129
PRAI GB 1975-49130		19751129		

AB A process is described for the preferential removal of H₂S from effluent gas streams containing a mixture of H₂S and CO₂ by contacting the **waste gas** with **aqueous** NaHCO₃ and catalytic oxidation of the dissolved H₂S. Thus, a **waste gas** stream containing 95.5% CO₂ and 4.5% H₂S was contacted by counter-current flow with an **aqueous** liquid containing O₂, NaHCO₃, and a NiCl catalyst. Contact time was .apprx.2 s. The purifd. gas contained 0.27% H₂S.

ST hydrogen sulfide removal **waste gas**; catalytic oxidn hydrogen sulfide; nickel chloride oxidn catalyst; **bicarbonate** scrubbing hydrogen sulfide; carbon dioxide sepn hydrogen sulfide

IT **Waste gases**
(hydrogen sulfide removal from **carbon dioxide**
-containing, by scrubbing with **aqueous** sodium **bicarbonate**
and catalytic oxidation)

IT Scrubbing
(of hydrogen sulfide, from **waste gases** by
aqueous sodium **bicarbonate**)

IT 37211-05-5
RL: **CAT (Catalyst use); USES (Uses)**
(catalyst, for oxidation of hydrogen sulfide in **waste gas** purification)

IT 124-38-9, uses and miscellaneous
RL: **USES (Uses)**
(hydrogen sulfide removal from gases containing, by scrubbing with

aqueous sodium bicarbonate and catalytic oxidation)

IT 7783-06-4, uses and miscellaneous
 RL: REM (Removal or disposal); PROC (Process)
 (removal of, from waste gases containing carbon dioxide)

IT 144-55-8, uses and miscellaneous
 RL: USES (Uses)
 (scrubbing by aqueous, of hydrogen sulfide from waste gases containing carbon dioxide)

L55 ANSWER 48 OF 54 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1976:126270 HCPLUS
 DN 84:126270
 ED Entered STN: 12 May 1984
 TI Removing hydrogen sulfide from a gas containing carbon dioxide
 IN Schievelbein, Vernon H.
 PA Texaco Inc., USA
 SO U.S., 7 pp.
 CODEN: USXXAM
 DT Patent
 LA English
 IC B01D
 NCL 423232000
 CC 59-2 (Air Pollution and Industrial Hygiene)
 FAN.CNT 1

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI US 3932583	A	19760113	US 1974-462907	19740422
PRAI US 1972-263911		19720619		

AB H₂S [7783-06-4] present in mixts. with CO₂ could be removed by treating the mixture with aqueous NaHCO₃ [144-55-8] solution containing nickel chloride [7718-54-9] and dissolved O. Thus, a gas comprising 95.5% CO₂ and 4.5% H₂S when bubbled into aqueous solution containing NaHCO₃, NiCl₂, and O, the H₂S content was reduced to 0.27%.

ST hydrogen sulfide bicarbonate removal; nickel chloride catalyst sulfide

IT **Waste gases**
 (hydrogen sulfide removal from, scrubber solution containing sodium bicarbonate and nickel chloride in)

IT Oxidation catalysts
 (nickel chloride, in removing hydrogen sulfide from gases containing carbon dioxide)

IT 7718-54-9
 RL: CAT (Catalyst use); USES (Uses)
 (catalysts, for oxidation of hydrogen sulfide)

IT 144-55-8, uses and miscellaneous
 RL: USES (Uses)
 (for removing of hydrogen sulfide from gas containing carbon dioxide)

IT 7783-06-4, uses and miscellaneous
 RL: REM (Removal or disposal); PROC (Process)
 (removal of, from gases containing carbon dioxide, scrubber solution containing sodium bicarbonate and nickel chloride in)

L55 ANSWER 49 OF 54 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1977:194422 HCPLUS

DN 86:194422
 ED Entered STN: 12 May 1984
 TI Eliminating hydrogen sulfide from a **gas** mixture containing
carbon dioxide
 PA Texaco Development Corp., USA
 SO Belg., 23 pp.
 CODEN: BEXXAL
 DT Patent
 LA French
 IC B01D
 CC 59-2 (Air Pollution and Industrial Hygiene)
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	BE 836821	A1	19760618	BE 1975-162895	19751218
PRAI	BE 1975-162895		19751218		

AB Gas mixts. containing large excesses of CO₂ and contaminated with H₂S were contacted with **aqueous** solns. of 0.01-0.25 mol **bicarbonate** ions/L to remove most of the H₂S. A gas mixture containing 3.67% H₂S and 96.33% CO₂ was bubbled through an **aqueous** NaHCO₃ solution so that the contact time was 3 s and the treated gas composition was 0.76% H₂S and 99.24% CO₂. The amount of H₂S was reduced from 4.5 to 0.27% on contact with a NaHCO₃ solution in the presence of O and NiCl₂ catalyst.

ST hydrogen sulfide removal **bicarbonate**; carbon dioxide purifn **bicarbonate**; hydrogen sulfide removal carbon dioxide; sodium **bicarbonate** soln acid removal

IT **Waste gases**
 (hydrogen sulfide removal from, sodium **bicarbonate** solution in)

IT 124-38-9P, preparation
 RL: PREP (Preparation)
 (hydrogen sulfide removal from, sodium **bicarbonate** in)

IT 144-55-8, uses and miscellaneous
 RL: USES (Uses)
 (in hydrogen sulfide removal from **waste gases**)

IT 7783-06-4, uses and miscellaneous
 RL: REM (Removal or disposal); PROC (Process)
 (removal of, from **carbon dioxide**-containing **gases**, sodium **bicarbonate** solution in)

L55 ANSWER 50 OF 54 HCPLUS COPYRIGHT 2004 ACS on STN
 AN 1976:21682 HCPLUS

DN 84:21682
 ED Entered STN: 12 May 1984
 TI Disposal of off-**gases** containing **carbon dioxide** and chlorine

IN Hirdler, Louis C.

PA Olin Corp., USA
 SO U.S., 5 pp.
 CODEN: USXXAM

DT Patent
 LA English
 IC B01D; C01B; C07D
 NCL 423232000

CC 59-2 (**Air Pollution** and Industrial Hygiene)
 Section cross-reference(s): 49

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 3896213	A	19750722	US 1973-376491	19730705
PRAI	US 1973-376491		19730705		
AB	A process is described for disposing of off-gases comprised of a gaseous mixture of Cl [7782-50-5] and CO ₂ [124-38-9], such as that from HClO [7790-92-3] generators. The off-gases are reacted with an aqueous solution of an alkaline compound and a reducing agent to produce a substantially neutral aqueous solution containing alkali metal salts that can be safely discarded. To produce HClO by the reaction of an aqueous solution of an alkali metal hydroxide with Cl gas, an alkali metal hypochlorite solution is first formed, which upon further chlorination produces a solution containing HClO. Frequently the				
Cl	gas used as the chlorinating agent is mixed with other gases, such as CO ₂ or air. When CO ₂ is present with the Cl in the reaction with the alkali metal hydroxide solution, the initial reaction gives a solution containing an alkali metal hypochlorite, an alkali metal chloride				
and	an alkali carbonate. This solution upon further chlorination in a second stage produces HClO and regenerates CO ₂ . Part of the CO ₂ formed is dissolved in the HClO solution produced and the remainder is in the form of a gaseous mixture with Cl. The HClO solution can be used in a chlorination process. There is a need at the present time for utilizing impure Cl gases containing CO ₂ in the production of HClO while preventing an excessive buildup of CO ₂ .				
ST	hypochlorite waste gas treatment				
IT	Waste gases (chlorine and carbon dioxide removal from, in hypochlorous acid manufacture)				
IT	7790-92-3P RL: IMF (Industrial manufacture); PREP (Preparation) (manufacture of, disposal of waste gas containing chlorine and carbon dioxide in)				
IT	124-38-9, uses and miscellaneous	7782-50-5, uses and miscellaneous			
	RL: REM (Removal or disposal); PROC (Process) (removal of, from waste gas in hypochlorous acid manufacture)				
L55	ANSWER 51 OF 54 HCPLUS COPYRIGHT 2004 ACS on STN				
AN	1975:415090 HCPLUS				
DN	83:15090				
ED	Entered STN: 12 May 1984				
TI	Regenerative sorption of carbon dioxide				
IN	Gidaspow, Dimitri; Onischak, Michael				
PA	Institute of Gas Technology				
SO	U.S., 11 pp. CODEN: USXXAM				
DT	Patent				
LA	English				
IC	B01D				
NCL	423230000				
CC	59-2 (Air Pollution and Industrial Hygiene)				
FAN.CNT	1				
	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 3865924	A	19750211	US 1972-231530	19720303

PRAI US 1972-231530 19720303

AB CO₂ is removed from a **gaseous** stream by contacting the stream with a synergistic sorbent composition of finely divided particulate alkali metal **carbonate** and dried de Gussa type C alumina, both of which consist of separate discrete **hydrated** particles. During sorption of CO₂ the CO₃²⁻ is converted to HCO₃⁻. The sorbent composition is subsequently regenerated thermally to reconvert the HCO₃⁻ to CO₃²⁻ while evolving CO₂ from the sorbent without forming a crust over the sorbent. The **carbonate** is an alkali metal **carbonates**, e.g. K₂CO₃, Na₂CO₃, Rb₂CO₃, or Cs₂CO₃. The rate of sorption of CO₂ is essentially independent of temperature at 20-60° and independent of the humidity or **water** content of the salt mixture as long as sufficient **water** is present in the salt mixture for the CO₃²⁻ → HCO₃⁻ reaction to occur. The system continuously removes CO₂ from a 1st **gaseous** stream, containing from trace amounts of CO₂ to < 50 mole %, and transfer to a 2nd, more concentrated, gaseous stream.

ST carbon dioxide removal **waste gas**; sorption regeneration carbon dioxide

IT **Waste gases**

(carbon dioxide removal from, sorbent containing alumina and potassium **carbonate** in, thermal regeneration of)

IT 124-38-9, uses and miscellaneous

RL: REM (Removal or disposal); PROC (Process)
(removal of, from **waste gas** by sorbent containing alumina and potassium **carbonate**, sorbent regeneration in)

IT 584-08-7

RL: OCCU (Occurrence)
(**waste gas** treatment by sorbent containing alumina and, **carbon dioxide** removal by, thermal regeneration of sorbent in)

IT 1344-28-1, uses and miscellaneous

RL: USES (Uses)
(**waste gas** treatment by sorbent from potassium **carbonate** and, carbon dioxide removal by, thermal regeneration of sorbent in)

L55 ANSWER 52 OF 54 HCPLUS COPYRIGHT 2004 ACS on STN

AN 1975:551668 HCPLUS

DN 83:151668

ED Entered STN: 12 May 1984

TI Treatment of a stack gas

IN Sawada, Seiji; Kaneko, Yoshitomi; Kiga, Yoshitaro; Kikuchi, Motoyoshi

PA Nippon Soda Co., Ltd., Japan

SO Jpn. Tokkyo Koho, 3 pp.

CODEN: JAXXAD

DT Patent

LA Japanese

IC B01D; C01D; B01K

CC 59-2 (Air Pollution and Industrial Hygiene)

FAN.CNT 1

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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PI JP 50010542 B4 19750422 JP 1970-32983 19700420

PRAI JP 1970-32983 19700420

AB A method is described for treating SO₂ in stack gas with NaOH produced by electrolysis of NaCl to recover NaHCO₃ and NaHSO₃, and calcining the **bicarbonate** and bisulfite to produce CO₂ and SO₂. The method

comprises the following steps: (a) treating an **aqueous** solution or a suspension of NaHCO₃ with the stack **gas** containing SO₂ and CO₂ to produce an **aqueous** solution of NaHSO₃ and a **waste gas** substantially containing no SO₂; (b) treating the **waste gas** with a solution of NaOH produced by electrolysis of NaCl, thereby reacting CO₂ of the **waste gas** with NaOH of the solution to precipitate NaHCO₃, and thereafter separating the precipitated **bicarbonate** to produce a mother liquor; (c) neutralizing the mother liquor with HCl to produce an **aqueous** solution of NaCl, and recycling the NaCl solution to the electrolysis process.

ST stack gas sulfur dioxide; **bicarbonate** stack gas sulfur dioxide;

IT Flue **gases**
 (sulfur dioxide and **carbon dioxide** removal from, by scrubber solution containing sodium **bicarbonate** and sodium hydroxide)

IT 7647-14-5, reactions
 RL: RCT (Reactant); RACT (Reactant or reagent)
 (electrolysis of, sodium hydroxide manufacture from, for **carbon dioxide** removal from flue **gas**)

IT 1310-73-2, uses and miscellaneous
 RL: USES (Uses)
 (flue **gas** treatment by scrubber solution containing, **carbon dioxide** removal by)

IT 144-55-8, uses and miscellaneous
 RL: USES (Uses)
 (flue gas treatment by scrubber solution containing, sulfur dioxide removal by)

IT 7446-09-5, uses and miscellaneous
 RL: REM (Removal or disposal); PROC (Process)
 (removal of, from flue gas by scrubber solution containing sodium **bicarbonate**)

IT 124-38-9, uses and miscellaneous
 RL: REM (Removal or disposal); PROC (Process)
 (removal of, from flue gas, scrubber solution containing sodium hydroxide in)

L55 ANSWER 53 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
 AN 1974:63443 HCAPLUS

DN 80:63443

ED Entered STN: 12 May 1984

TI Removal of acidic gases from gaseous mixtures

IN Thirkell, Harry

SO U.S., 13 pp.

CODEN: USXXAM

DT Patent

LA English

IC B01D

NCL 423223000

CC 59-2 (**Air Pollution** and Industrial Hygiene)

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 3773895	A	19731120	US 1971-208499	19711215
PRAI	US 1966-587274		19661017		
	US 1970-56174		19700709		
AB	In a 2-stage scrubbing system for the removal of acidic gases using alkali				

metal **carbonates** or alkali metal phosphates and an alkanolamine, the operation is improved by (1) passing supplementary stripping steam to the 1st regeneration zone and (2) heating spent absorbent solution leaving the 2nd absorption zone by indirect heat exchange with hot spent absorbent solution leaving the 1st absorption zone. In an example, 155,663 m³/hr of **gas** containing 21.92 volume % **CO₂** at 273 psia and 240°F is scrubbed successively with (1) 3,570,000 lg/hr of **aqueous** solution at 226°F containing 30 weight % K₂CO₃ and 3 weight % diethanolamine and (2) 438,000 lb/hr of **aqueous** solution at 122° F containing 20 weight % diethanolamine. Purified **gas** containing 0.1 volume % **CO₂** is produced at 121,478 m³/hr. Spend solution, containing 10,260 lb CO₂/hr, from

the

2nd absorber is heated from 190 to 230°F by exchange with 1st absorber spent solution before entering the 2nd stage (19 psia) regenerator. Stripping steam, put into the 2nd stage at a rate sufficient only for satisfactory regeneration of spent absorbent in this zone, passes into the 1st stage regenerator where addnl. stripping steam is produced by a heating coil. Heat input to the 2nd stage reboiler and stripping steam generator and to the coil for addnl. steam is 105 + 106 btu/hr. Similarly, monoethanolamine is used with regenerator bottom pressures of 0.23 and 2.5 kg/cm², resp.

ST acidic gas removal alkanolamine; carbon dioxide removal alkanolamine; diethanolamine carbon dioxide removal

IT **Waste gases**

(**carbon dioxide** removal from, ethanolamine and potassium **carbonate** scrubber solution in)

IT 124-38-9, uses and miscellaneous

RL: **REM (Removal or disposal); PROC (Process)**
(removal of, from **waste gas**, ethanolamine and potassium **carbonate** scrubber solution in)

IT 111-42-2, uses and miscellaneous 141-43-5, uses and miscellaneous
584-08-7

RL: **USES (Uses)**

(**waste gas** treatment by scrubber solution containing,
carbon dioxide removal in)

L55 ANSWER 54 OF 54 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 1973:549217 HCAPLUS

DN 79:149217

ED Entered STN: 12 May 1984

TI Treating alkaline waste **water** containing sulfides and acidic oils

IN Arita, Hideo

PA Chisso Engineering Co., Ltd.

SO Jpn. Kokai Tokkyo Koho, 4 pp.

CODEN: JKXXAF

DT Patent

LA Japanese

NCL 91C91; 13(7)A31; 91C92

CC 60-2 (Sewage and Wastes)

Section cross-reference(s): 51

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 48059666	A2	19730821	JP 1971-95051	19711126
	JP 53043734	B4	19781122		
	CS 170186	P	19760827	CS 1972-3090	19720506
PRAI	JP 1971-95051		19711126		

- AB In purifying a **gas** containing at least H₂S, CO₂, and vapors of acidic oils by scrubbing with a caustic alkali, the by-product alkali waste **water** containing at least alkali sulfide and acidic oils is contacted at .apprx.1 atm with CO₂, which reacts with **water** to form acidic HCO₃⁻ at .apprx.1 atmospheric. The alkali sulfide is thus decomposed to H₂S; the alkali salts of the acidic oils are decomposed to free the acidic oils, and a solution of alkali carbonate containing alkali **bicarbonate** is formed. Thus, an alkali waste **water** (1000 cm³/hr) containing Na₂S 6.23, Na₂CO₃ 3.58 NaOH 0.21, Na salts of acidic oils (1.5 g/100 cm³) from naphtha crackers in an C₂H₄ plant was contacted countercurrently with 98% CO₂ (50-60 l./hr) at 1.01 atmospheric in an absorber. The absorption solution was settled, and acidic oils were separated. The Na₂S content in the **aqueous** solution was reduced to 0.16-0.36 g/100 cm³, and the content of the acidic oils was reduced to a trace. The **aqueous** solution was treated with a small amount of NaClO to decompose the residual sulfides and H₂S. After removing the precipitate, the solution was concentrated to yield Na₂CO₃ crystals.
- ST alk wastewater treatment; carbon dioxide treatment wastewater; sulfide wastewater treatment; oil wastewater treatment; naphtha cracking wastewater treatment
- IT Waste **water** treatment
(oil and sulfide removal, from **waste gas** scrubber solution, **carbon dioxide** in)
- IT Hydrocarbon oils
Sulfides, uses and miscellaneous
RL: **REM (Removal or disposal); PROC (Process)**
(removal of, from **waste gas** scrubber solution,
carbon dioxide in)
- IT 124-38-9, uses and miscellaneous
RL: **USES (Uses)**
(waste **water** treatment by, hydrocarbon oil and sulfide removal in)

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